JULY 1995

CED

Video monitoring ◆ Return path testing ◆ SCTE wrapup

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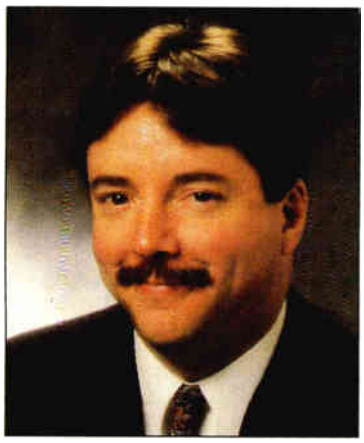

Putting the inmates in charge

Last month, the Progress and Freedom Foundation, a Republican-influenced Washington think tank, made headlines by proposing that the Federal Communications Commission be abolished within three years and be replaced by an "Office of Communications" that would be under direct control of the president.

In addition, PFF proposed, in its 88-page document, that control of the RF spectrum should be shifted from the FCC and given directly to private industry to do with what it pleases. Additional proposals called for complete deregulation of the telecom and video markets, as well.

The cable TV industry might be tempted to go along with such a proposal, taking pleasure in the dismantling of the agency which has caused it so much grief in recent months. But that would be shortsighted and the benefits short-lived.

Downsizing the federal government is a popular theme today–and perhaps its time has come. There's a lot of merit to almost any proposal that attempts to rein in government agencies that are growing almost without control. With the recent addition of about 240 people in the newly created Cable Service Bureau alone, the FCC has swollen to more than 2,000 employees with a budget in the tens of millions. In an era of cost-cutting initiatives, the FCC seems like an easy target.

But is it the right target at the right time?

With the passage of the 1992 Cable Act, the FCC was given the task of carrying out all the dirty work while the legislators walked off with all the credit–and votes–for saving taxpayers millions in rate increases. All told, the Commission had to make dozens of rulemakings and sort out the grubby details of some extremely difficult issues, like the cable/consumer electronics compatibility conundrum that has defied a rational solution for more than a decade.

If telecom reform becomes a reality, Washington insiders predict that up to 80 rulemakings will have to be undertaken to make sure the transition goes smoothly. PFF argues that such rulemakings aren't needed, that the marketplace has a vested interest in sorting itself out. Isn't that akin to putting the inmates in charge of the asylum?

There's simply too much at stake in the early days to put the free market in charge. How can anyone expect the players to police themselves when their success at garnering spectrum will determine their future profits and/or losses? The FCC may not be perfect–it's often blindsided by incomplete input and sometimes by irrational thinking–but it's the perfect agent for compromise between the public and private industry.

That's not to say the FCC should be given a stay of execution in perpetuity. Over time, as the convergence process takes shape, the FCC's role should be re-examined to determine its need. Perhaps a phase-out period could be adopted to help the Commission's successor transition into place so that decisions can be made in a timely manner.

Putting off any changes within government agencies is often exactly the manner in which these groups seem to take on new lives of their own, I know. But right now, the FCC can be a guiding light through the fog created by new technology and politics.

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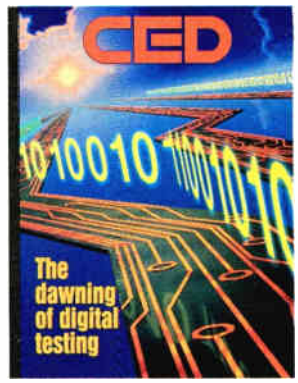

About the Cover

Photo by Ron Lowery, The Stock Market.

Departments

Standard and the FCC offer the perfect plan to improve your cash flow.

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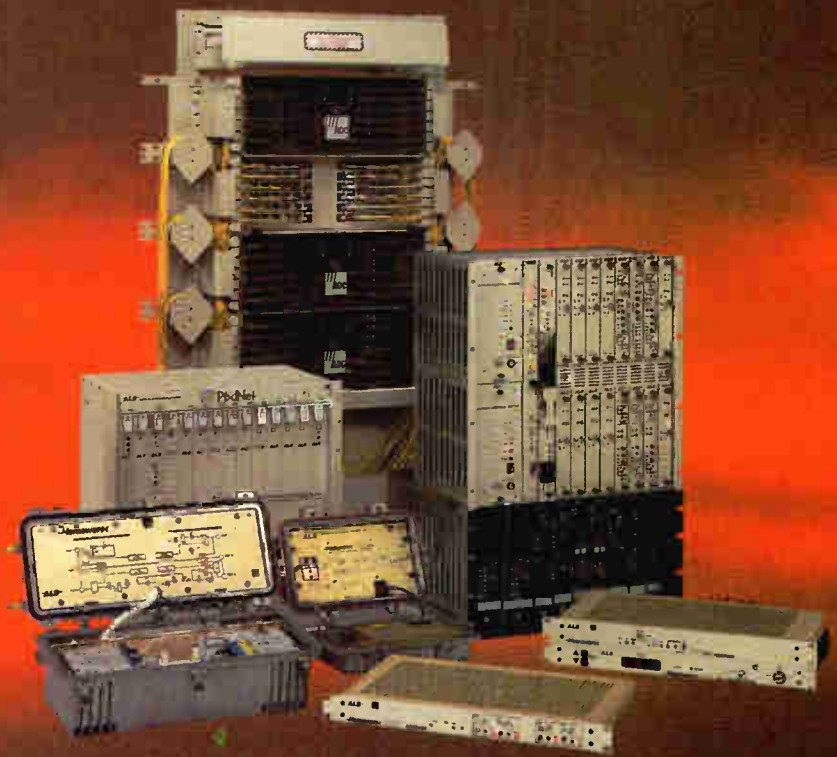

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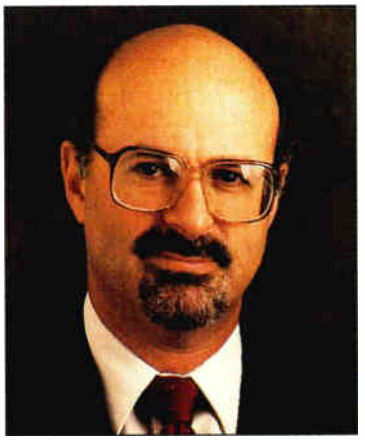
So you've forgotten about HDTV? Don't worry, it's still around. And there are still some headaches in store for both broadcasters and cable operators.

Get out the aspirin: HDTV headaches ahead



By Jeffrey Krauss, student of techno-politics and President of Telecommunications and Technology Policy

Current status

The Grand Alliance HDTV equipment has been at the Advanced Television Test Center in Alexandria, Va. for several months. Interference and impairment tests were done in April and May, and video picture quality test tapes are being made during June. These tapes are shipped to the Advanced Television Evaluation Laboratory in Ottawa, Canada, where subjective quality ratings are assigned by panels of non-experts. Test reports should be completed by late August.

The hardware will stay in Alexandria until late June, and then it will be shipped to Charlotte for over-the-air field testing. HDTV transmissions will use TV channels 6 and 53. There are no over-the-air broadcast stations on either of these channels in Charlotte. But earlier tests on channel 6 in Charlotte ran into severe ingress problems, caused largely by poorly shielded wiring installed by subscribers in their homes. Ingress interference into the channel 6 cable signal created a serious public relations problem for all involved in the testing, and this headache is likely to recur. Because HDTV will double the number of over-the-air channels, at least during the 15-year transition, cable systems can expect twice the number of complaints about ingress interference.

In September or October, the Advisory Committee on Advanced Television Service will submit to the FCC a full report of the testing and a recommendation to adopt the HDTV standard. The FCC then plans to adopt a series of decisions in three areas: technical standards, HDTV channel assignments and broadcast policy issues.

For technical standards, much of the work is non-controversial and is already done. MPEG-2 compression and transport protocols will be adopted. Dolby AC-3 will be selected for audio. And the FCC will have the opportunity to reject the proposed VSB modulation method and adopt QAM instead, resulting in worldwide compatibility.

The FCC will also adopt a channel assignment plan, which will tell each existing TV station which new channel it will use for HDTV. Here is a potential source of conflict. Lower UHF channels are much more desirable than higher UHF channels. You need much more power on channel 60 to achieve the same coverage as on channel 20. And some channels are subject to more interference than others, depending on the existing assignment of NTSC channels. You can expect to see broadcasters fighting among themselves for the more desirable channels.

Finally, the FCC plans to revisit its 1992 decision on how these channels may be used. The current "simulcast" policy says that each existing broadcaster will be given an additional channel, for free, and must use that HDTV channel to transmit the same programming in high resolution that it transmits in standard definition on its NTSC channel, at least most of the time. But some broadcasters want to use this HDTV channel for multiple channels of compressed digital standard definition TV. Others want to use it for paging or mobile radio service. An FCC decision that is too liberal, and allows too much flexibility in how the channel is used, could seriously retard the development of HDTV. And Congress could step in and force auctions.

VHS vs. Beta?

We're heading for another VHS vs. Beta incompatibility headache. Laboratory tests showed that 16-VSB modulation performed better than 32-QAM modulation, but it was because the VSB filters were fabricated more carefully, not because VSB is inherently better. But the cable industry has decided to use QAM rather than VSB as its standard modulation scheme for compressed standard definition digital video. An international standards organization known as DAVIC has adopted QAM for its digital cable TV standard.

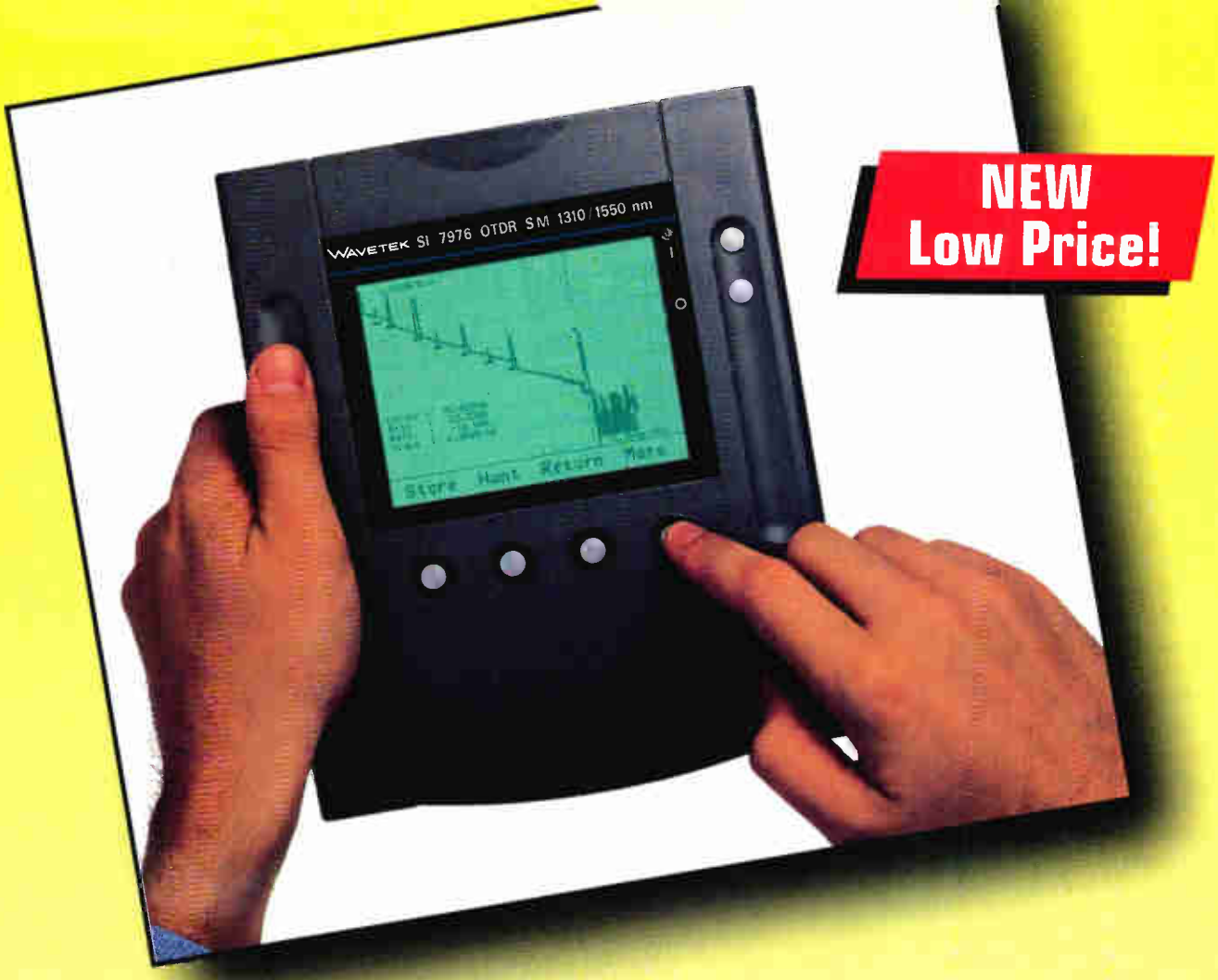
Meanwhile, U.S. broadcasters are examining a more exotic modulation method known as Coded Orthogonal Frequency Division Multiplexing (COFDM). If hardware can be built to operate in a 6 MHz channel, it will be tested during the August time frame. Similar hardware has been built to operate in an 8 MHz channel in Europe. Unlike the theoretical equivalence between QAM and VSB, analysis has shown that COFDM cannot perform better than VSB or QAM at comparable cost. But the broadcasters haven't given up.

It looks like the United States is the only country so far planning to use VSB, while QAM will be universally used. This will increase costs to consumers. The FCC process will provide an opportunity for the U.S. to make the right decision on HDTV modulation–junk the VSB approach and go with QAM.

Must-carry

Here's the really big headache for cable operators. How many broadcast TV signals does your system carry? Ten? Twenty? Do you have room for an additional 10 or 20 TV channels? You'd better make room. As each TV broadcaster puts its HDTV signal on the air, you can expect a request for cable carriage. And you will have to comply.

You can expect a handful of HDTV stations to start broadcasting in 1997. Not all the details are worked out yet, but most of the hard technical decisions about digital compression have been made. What's left are just a few headaches. CED



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unlicensed spread spectrum devices under Part 15 of the FCC's rules. Apple argues that the addition of NII Band fair access technical rules to this spectrum would allow fuller use of the frequencies while permitting smooth transition to the NII Band.

Standards panel seeks input

Standards, standards, and more standards. The Information Infrastructure Standards Panel, the cross-industry effort sponsored by the American National Standards Institute (ANSI), is presently seeking input from standards-developing groups on the standards needed to implement the national and global information infrastructures.

This cooperative effort follows an announcement in March that the panel had finalized the identification and draft descriptions of an initial 16 standards requirements needed to link separate networks into a national "information superhighway."

Since that time, the panel has contacted more than 30 standards developing organizations to participate in a needs review process that will help the panel determine the standards that are necessary for the process to go forward.

During a meeting in Washington on May 23-24, participants were given progress reports from companies, government agencies and other organizations. CableLabs was among several groups that were in attendance at the meeting.

In addition, speakers included Mark Coblitz of Comcast, who spoke about the Cox, Comcast, TCI and Sprint alliance; Denny Hylton of Bell Atlantic, who talked about BA's trials; Tom Gannon of Digital Equipment Corp., who spoke on interoperability issues; and George Spix of Microsoft, who talked about the need for competition and joint ventures between vendors.

Arthur Reilly, director, network performance requirements and applications at Bellcore, said the IISP has formed a task group to identify standards for interfacing cable TV and telecommunications networks.

"While needs and standards will continue to evolve, at this point it appears existing standards in this area meet the needs," he said.

The group's next meeting will be August 8-9 in Washington. More information is available from R.M. "Chick" Hayden, ANSI director of information infrastructure programs, at 212/642-4920, or via e-mail, chayden@ansi.org.

Oracle, HP team on PacTel ITV system

Oracle Corp. and Hewlett Packard are working together to provide Pacific Telesis with a scalable interactive TV system that uses Oracle's Media Server/Media Net software on HP MediaStream Server video servers.

The fruits of the joint collaboration will be unveiled in San Jose, where PacTel will deploy video on demand, later this year. Interactive service will then be expanded to three other California beachheads, including San Diego, Los Angeles and Orange County. The Oracle/HP equipment will be paired with Scientific-Atlanta's PowerTV set-top to deliver video services to the home.

Oracle Media Server acts as a multimedia library that stores, retrieves and manages information, including video, audio, images, text and relational data. Media Net transparently connects the Media Server to the set-top, or client. Oracle Media Objects, a new authoring tool, enables multimedia to be created over any network.

HP's server utilizes an architecture called the video transfer engine that is designed to move large amounts of digitized video information across networks in a way that lowers the cost of delivering video streams. The scalable system can be used to deliver as few as 75 or as many as 10,000 video streams, depending on need.

Time Warner demos phone service ability

As part of its fight to offer a suite of telecommunications services to residents of Ohio, Time Warner Communications testified before the state Public Utilities Commission (PUCO) that it has the necessary managerial, technical and financial capability to offer local telephone service.

During the hearings, key Time Warner executives described the company's operations in Rochester, N.Y. and in the United Kingdom, holding them up as evidence the company can offer such services. Time Warner says Cincinnati Bell, which has questioned Time Warner's abilities, has said it could lose from 20 percent to 60 percent of its market if competition is allowed.

Time Warner has applied for permission to offer telephone service in 37 Ohio counties–promising to invest $500 million in its networks to offer telephone service. The company has already been granted permission by the city of Columbus, but needs approval from the state Public Utilities Commission to do so.

Jottings

Broadcom Corp. has licensed DigiCipher II forward error correction technology from **General Instrument** and plans to integrate it into its QAM demodulator chip. The licensing agreement also calls for the two companies to collaborate on a next generation, higher data rate QAM and error correction system . . . **Cox Communications**, in conjunction with **Virginia Power**, will test transmission of interactive energy management services over its network in Hampton Roads, Va., using technology from **Nortel**. The six- to 12-month test, which will determine the network's suitability for remote meter reading, outage detection and energy use information via the TV, may expand to a market rollout if successful . . . **NBC** and **Microsoft** have formed a strategic alliance to develop and market multimedia products, including online, CD-ROM, interactive TV and digital products, and the integration of these products into traditional broadcast and cable TV services . . . **ACTV**, through its newly-formed cable pay service, INTV, has expanded its service to 250 homes in the Los Angeles area over Ventura County Cablevision. The service allows viewers to choose camera angles, focus on individual players during sporting events, call up statistics and activate instant replay . . . Meanwhile, **Bell Atlantic Video Services** hooked up the first paying customers to its video on demand market trial in Fairfax County, Va. During the test, up to 1,000 homes will use the Stargazer navigation system to get access to more than 700 programs, priced between 49 cents and $4.49 . . . Don't look for results of **CableLabs'** high-speed data RFP quite yet. The deadline for response to the proposal was extended from June 9 to June 30. More than 800 copies of the RFP were mailed or downloaded anonymously, electronically . . . **Primestar Partners** has asked the FCC to reverse an earlier decision to void Advanced Communications Corp.'s DBS construction permit and Tempo's orbital slot. Tempo had planned to launch two high-power DBS birds and lease space to Primestar, resulting in yet another player in the DBS market. Primestar wants the FCC to respond by August 15 so it can proceed with plans to launch service in 1996 . . . **Convergence Industry Associates** has developed a home page on the Internet. Users can find information about the telecommunications/cable consulting company at http://www2.csn.net/ lyokell . . . CED

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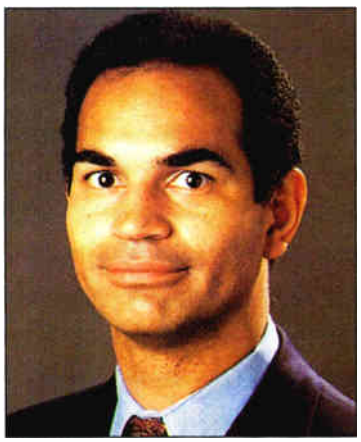
Taking technology into the real world

There comes a time in everyone's career when they stop, look around, and evaluate where they are. For TCI's Jerry Gaines, the catalyst for that re-evaluation was his wardrobe.

"I started working out of undergrad at Procter & Gamble Co., as an R&D engineer making soap," Gaines recalls, "and had a choice of either going on for an advanced technical degree, or going for a business degree. I looked at myself, saw a plastic pocket protector, glasses with side shields, and polyester, short-sleeved, shiny shirts. I looked at the people running the company, and none of them looked like that."



Gerald Gaines

Already well-versed in the arts of chemical engineering, Gaines decided to augment his wardrobe with an MBA from the Harvard Graduate School of Business Administration in order to gain a broader perspective and enter the world of management. Eventually, his dual focus on both engineering and business arts would lead him into an enterprise position in the cable industry, as Gaines was recently named senior vice president of telephony services for TCI Communications Inc.

Like his counterparts at Time Warner and other major MSOs, Gaines is charged with the task of leading the cable industry into becoming a successful, competitive provider of telephony services. To that end, he sits on the board of Teleport Communications Group, representing TCI, as well as on the board of the Sprint, Cox, Comcast venture, of which TCI owns 30 percent. His goal for TCI's telephony business is quite ambitious: to see, in three to four years, the company offering wired and wireless telephony, voice and data, business and residential service to 15 million households. And if 10 to 15 percent of those 15 million signed up for service, he'd be ecstatic.

To help realize this vision, Gaines is "working very hard to make the venture with Sprint as real as possible, as fast as possible." In one manifestation of that, he is focusing on combining existing products into new services: for example, taking Sprint long distance service and packaging it with TCI's cable products, offering customers an attractive discount when they sign up for both. Another project: determining which technology TCI should choose to implement for Personal Communications Services–GSM (the European standard), which can be deployed today, or CDMA (Code Division Multiple Access), which is not quite ready for deployment, but appears promising.

The bondage of bureaucracy

As a former employee of US West NewVector, the RBOC's wireless arm, Gaines has a unique perspective on PCS, having helped develop new business by making acquisitions and conducting strategic planning. In fact, Gaines held a number of positions at US West from 1986 to 1991, including president and CEO for US West Service Link, which provides operator and computerized validation services.

The many layers of corporate bureaucracy at the RBOC soon proved too much for him, however, as he began to "chafe under thousands of layers of management [necessary] to get things done," which left him itching to start his own telecom management services firm, GCG Inc., in 1991. From GCG, where he worked with telephony, broadband, wireless and information services clients, it was a short walk to TCI.

Like others who have left the telephony industry to join cable, Gaines believes MSOs are actually in a good position to compete in the telephony realm, and even predicts that all seven of the RBOCs will not survive the battle intact, but will eventually have to consolidate as competitive pressures overtake them. "Economically, they have to start from ground zero," notes Gaines. "Almost all of their assets...don't apply to the telecommunications world of the future.

"Contrast that with where we are. Our broadband network that sits in place today is fully usable. We have to add things to make it two-way capable, and we have to add capacity, but on an incremental basis. We are probably two-thirds of the way to the finish line, whereas the RBOCs are still at the starting line."

Taking technology into the community

What Gaines excels at is translating the technology into products that businesses and consumers will buy, and into services that people will actually use. In the Denver community, he is using that talent to bring career opportunities to diverse areas of the city. As a board member of the Five Points Media Center, he helps to direct policy for the organization, expanding career options for people who use the center. Currently, the center offers studio production facilities for radio and TV broadcast, where interns can be taught the entertainment side of the industry. In turn, those interns will one day be candidates for jobs at area businesses like TCI, Jones Intercable, and local radio and TV stations.

A nine-year resident of Colorado, Gaines enjoys the West for its open spaces, and the "frontier" mentality of his neighbors: "people think that anything can be done." He'll soon be packing up the family–Justin, 8; Andrew, 6; Whitney, 4; and wife Amy–for a biking and hiking vacation in Yellowstone National Park.

What's next professionally? Though Gaines decided 10 years ago that telecom was the industry for him, he does admit that he bores fairly easily. Once the Sprint venture is off-and-running, and when TCI becomes well-versed in the art of telephony, what then?

"If I'm sitting back clipping coupons, I'm likely to go out and do something else," he notes wryly. "But TCI is not that kind of an organization." CED

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Circle Reader Service No. 9

Telecom reform coming up fast

By Wendell Bailey, VP of Science and Technology, NCTA

Recently, I was talking with a friend at a retirement party, and as these things usually go, the talk turned to the Senate vote on telecom reform. It seems hard for many people to understand how the majority of lawmakers in Congress could make such a change in the cable industry just three years after socking it to us in such a depressing style. But this is Washington, and Congress is a complicated thing.

So what exactly has happened to us this time? When will we see the benefits of these new rules? What role will the FCC play in all of this? Let me explain, if I can, where we are and what must come next.

Progress of the bill

Several weeks ago, the Committee on Commerce of the House of Representatives passed a bill (HR1255) on telecommunications reform. This was the same bill, except for amendments agreed to during a "mark up," that had previously been passed by the Subcommittee on Commerce, Science and Technology in an earlier mark up session. After the House Committee on Commerce passed this bill, it moved on to other matters, with a schedule to try and bring this measure to the floor of the House for a vote sometime in June or July.

At that time, it would be possible for amendments to the bill to be introduced that can change various provisions of the agreed upon language.

After the House got its bill out of Committee, the Senate, which had already passed a bill through a committee mark up, brought its bill to the floor of the Senate for debate. At this stage, the proponents, as well as the opponents to the measure, were each given time to discuss and debate the ideas and particulars of the pending legislation. The Senate is known as the "world's greatest deliberative body," and it generally takes great relish in debating various provisions with passion.

Literally hundreds of amendments, amendments in the second degree and unanimous consent decrees were dealt with. Each of the attempts to modify sections of the bill had to be debated (unless there was an agreement to deal with the opponents of that particular section) and voted upon. This went on for several days. The original time frame for the passage of this piece of legislation was going to be three to four days after it was brought to the Senate floor. One senator felt that this was too fast, and vowed to do what he could to slow it down and, if possible, kill it with procedural tactics such as the "filibuster."

In a filibuster, a senator (or several of like mind) will debate an item endlessly until the other senators give up any hope of getting anything else done and agree to forgo their own efforts on behalf of a bill. The only way to stop such an attack is to introduce a motion for "cloture." If this motion succeeds, then debate is limited to a specified amount of time before the measure must be voted on.

This is what happened in mid-June, when a "cloture" motion passed, and debate was limited to 30 more hours. Amendment after amendment was offered on dozens of details in the bill. Many were aimed at deleting whole sections, such as the rate relief sections that cable had fought so hard for. In the end, the Senate voted on S652 (as amended), and the item passed by a vote of 81 in favor, with 18 opposed.

By the time you read this...

So what happens now? Because the bill passed out of the Commerce Committee in the House and has not been to the floor for a vote yet, I cannot say with precision what the next step will be, but it is almost 100 percent certain that the version that gets voted on at the floor of the House will have different provisions and details than the bill that passed the Senate.

If that happens, both Houses of Congress will appoint certain members of their respective chambers to a special committee assignment known as a "conference." In this conference, Senators and House members will engage in give and take, debate, compromise, and other techniques for coming to an overall agreement on a single document.

Once this is agreed to by the Conference Committee, each House of Congress will bring its respective bills up for one more amendment. At that time, an amendment will be offered that calls for striking out all after the title and adding the language from the Conference Committee. Because this procedure is carried out in both chambers, they each will now have a bill with the same words and punctuation.

Now, each bill is called up one more time for an "up or down" vote. If they each pass, as is expected, then the combined bill (with the numbers of both the House and Senate on it) will be sent to the President of the United States for his consideration. The President can either sign the bill, and it becomes law, or he can veto it, and it goes back to each House for another vote. It takes a two-thirds majority to override a Presidential veto.

Each chamber will take the matter up separately, because if either House does override the veto, the bill becomes law, in spite of the President's attempt to veto it.

By the time that you read this column, the bill should be in conference. If all goes well, a month later, the first major change in the 1934 Communications Act will have occurred, and along with that milestone, will be the certainty that our industry will have the right to play a pivotal role in the telecommunications landscape of the future. CED

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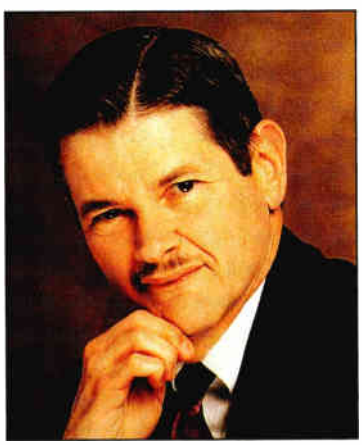

By Jim Farmer,
Chief Technical Officer,
Antec Technology Center

I'm pleased to be joining the fine cadre of columnists in *CED*. Kudos to my predecessor, Chris Bowick, who has done a fine job for the last eight years, and who has left some mighty big shoes to fill. Lacking ideas for a particular format or a subject matter bias, I'd appreciate hearing from you. The best way to contact me is via e-mail, to *jfarmer@ix.netcom.com*. If you prefer, contact me on Prodigy at *CKJB29A* or America Online at *Jimfarmer2*. For the connectivity-challenged among you, fax me at (404) 441-2477.

As a last resort, you could call me. I'd like to talk to you, but as my trusty assistant Christy Anderson will tell you, I'm not too good at staying by the phone. Christy fights a losing battle to keep me organized. And if you could see my desk, you really wouldn't want me adding notes on our conversation to the mountain of little pieces of paper already on it.

Ode to joy (of fiber nodes)

At no time in memory have we seen more changes taking place in the industry. Broadband networks seem to be part of everyone's plan for the information super hypeway (whatever it really is). Part of what is happening is that broadband hybrid fiber/coax is the only viable medium for delivery of broadband services to the home. This makes our industry very visible in some high places right now. Translation: cable is really cool. Translation: more competition is coming, and you've got to be sharp to beat it.

One of the most sure trends (to the extent that such is not an oxymoron) is that in the future we'll deal with two-way services. Two-way services have been talked about since before I was part of the cable television industry. (Now, I'm not saying I've been around the block already, but when I transferred to Scientific-Atlanta's nascent broadband group, my wife and I were expecting our second child. Susan graduated from college last month.) Two-way has so far been pretty much a technology that almost worked, but for which there was limited economic justification.

This is about to change, and in five years, it would be surprising to find any systems that are not either two-way active or in the process of being upgraded. Almost all the new services being talked about require two-way plant.

Fortunately, two-way plant will now finally work. In the past, when systems were built with tree-and-branch architectures, there was too much noise funneling and too many sources of ingress to let the reverse plant work well. The problem was that tree-and-branch architectures were very efficient for one-way distribution of broadcast material. As the signal went out farther from the headend, it took more paths. This works fine for outgoing signals, which split many times (with appropriate amplification) to go in different directions. However, when we try to get signals back from all the different branches, we run into trouble. Each branch contributes its own noise and ingress, which get added together. Thus, one signal coming from one branch has to compete with the total noise and ingress from many branches. The result is sort of like whispering during a cat fight.

Limited success has been achieved, but between the difficulties of making two-way work and its limited economic justification so far, the technology has languished. Now, with fiber-to-the node and ever decreasing node sizes, we have the fortuitous circumstance that the use of the reverse path is feasible in the real world. The limited size of a node means less noise funneling and fewer sources of ingress.

Each node will need its own reverse path to the headend. The reverse path may be a separate fiber from each node, or it could be done by bundling the reverse spectrum from several nodes, all but the first of which would be block converted to some other spectrum for backhaul. This latter concept reduces the number of fiber transmitters in the field and receivers in the headend, but puts somewhat more stringent linearity requirements on the transmitters that are used.

Besides the noise benefit, smaller nodes make more backhaul bandwidth available. To date, we have not used the 5 MHz to 30 MHz band very much, but are now expanding the upper edge to 40, 41 or 42 MHz, depending upon whom you ask. However, when you start adding up the likely bandwidth required in the future–assuming some of the proposed applications really take root–then you quickly run out of usable bandwidth. The solution is to reuse it from one node to another.

More downstream bandwidth

Smaller nodes also allow reuse of part of the spectrum to provide more downstream bandwidth for each home. This has been proposed in conjunction with providing video-on-demand services in the digital world, but in the interim, many systems will want to provide services-on-demand using much more cost-effective analog convertors.

One can become convinced that, in an environment of many small nodes, a lot of video-on-demand and other on-demand services may be accommodated in the analog domain while we wait for the cost of digital convertors to come down.

Fiber optic nodes provide higher quality, more reliable service, more individualized bandwidth, and the ability to use the reverse for more than just impulse pay-per-view. They get us into advanced pay-per-view, telephony, data, home control, and who knows what else. When you think about it, is it any wonder that some people get emotional over such marvels? CED

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Reaching a compromise within a box

By Dr. Walter S. Ciciora, consultant

There has been a lot of press lately about a "compromise" between the cable and the consumer electronics industries over the Decoder Interface. While most on the cable side seem to be in agreement with the compromise, there are some who still feel it has serious problems.

The biggest concern

My biggest concern has been that the cable industry has not been paying much attention to the consumer interface issues in general, and the Decoder Interface and its problems in particular. But now it appears highly likely that the FCC will issue rules governing the Decoder Interface and its implementation. These rules will cost the industry money, and they are likely to limit some of the ways in which cable can implement services, particularly new and experimental services. The FCC has implied that there may be a "no separate charge" ruling on the modular decoder which plugs into the Decoder Interface socket.

The Decoder Interface has evolved considerably from its original form. The need to compromise with the consumer electronics side has changed it in ways that make it more expensive than the old "MultiPort." While the MultiPort had the potential to be 40 percent to 60 percent of the cost of a set-top box, the new Decoder Interface module will probably not be less expensive at all. It may not be much smaller, either. It may, in fact, reside on top of the TV and just have a cable to connect to the back of the TV. It is important to understand the current embodiment of the Decoder Interface concept.

My concern is that the cable industry will only pay attention to these issues when it is too late–when the FCC rules finally come out.

The box

By the "box," I don't mean the set-top box. I mean the set of constraints we find ourselves in as we try to find a solution to the consumer interface problem. The consumer interface problem has been around for a long time, and there is substantial controversy over how serious it is from a consumer perspective. Some believe that the consumer interface problem is a serious inhibitor to subscriber satisfaction and the penetration of advanced services. Others believe it is overblown and concerns the manufacturers and retailers of TVs and VCRs much more than it concerns consumers.

Others see it as a simple populist issue Congress used to avoid working on more controversial issues–a way of taking voter focus off of serious national problems. Any such debate is pointless at this time.

Technologists are taught that problem solving involves an understanding of the "boundary conditions" for the situation. Boundary conditions create the limits of the problem and constrain the solution. The more defined the boundary conditions, the more limited the solution. When the boundary conditions are tight, there may be only one possible solution. If the solution to the problem is distasteful, the only way out is to find a way to modify the boundary conditions.

Another way of looking at this is that the boundary conditions form a "box" into which the solution must fit. If the solution is unpleasant, the only way out of the box is to kick out one of its sides.

The box we're in consists of tall sides and a floor:

1. The 1992 Cable Act's Section 17.
2. The May 1994 FCC Report and Order.
3. The FCC's insistence on a "joint position."
4. The consumer side's resistance to truly open, unedited, near real-time communication from the consumer through the TV and VCR to the Decoder Interface plug-in modules.
5. The belief that the cable industry is better off with a compromise than with a ruling imposed unilaterally by the FCC.

The first two sides of the box have been discussed on these pages many times. The third side of the box, the FCC's insistence on a joint position, is based on the FCC's hope that this will bring the least objection and fewest comments later. If the two sides can struggle through a compromise, it is more likely to "stick."

The fourth side of the box stems from the consumer electronics side's negotiation style. Some on the consumer electronics side have sensed the FCC's strong actions against cable. The consumer electronics side extrapolates that attitude to this issue and believes that it has an automatic win if it can simply avoid giving in.

Some on the consumer electronics side are convinced the burdens will fall on cable, and that their goal is to maximize their advantages. This has made negotiations extremely difficult. Fortunately, there are some on the consumer side who are more reasonable and who seek to improve the situation for the consumer.

The final constraint is self-imposed. This is the conviction that almost anything the FCC would do is worse than the level of compromise we have. This is based on experiences with rates and other restrictions. The FCC seems to have adopted the attitude that cable supplies set-tops with the intention of extracting money from subscribers, rather than for the purpose of compensating for deficiencies in the design of TVs and VCRs and facilitating choice in new services.

Is there a way out of the box?

The boundary conditions described above are very limiting. The compromise we believe we have reached has few or no options unless someone can kick out one of the sides of the box. Then other solutions may be possible. But under the current boundary conditions, we have little choice. CED

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Narrowcast and broadcast fiber optic technology

Business plan clarifies technology choice

By Gregory Hardy, Director of Marketing, Transmission Products, Scientific-Atlanta

Fiber optic transmission was first introduced into CATV broadband networks in 1988. Since the deployment of satellite programming, no other technology has made a greater impact on the CATV industry than fiber optics. Today, fiber is being installed into advanced broadband networks at a rapid pace. In fact, the amount of new fiber optic cable and electronics doubles every year.

There are solid technological and economic reasons behind the rapid deployment of fiber transmission technology.

1. Distance–broadband programming may be carried over much longer distances than via conventional RF distribution amplifiers. This facilitates hubbing and reduces the need for expensive headends.

2. Improved performance specifications–signal quality via optical transmission is much greater than from an equivalent cascade of RF amplifiers. Carrier-to-Noise (CNR), composite triple beat (CTB) and composite second order (CSO) specifications all significantly benefit from fiber optic transmission. Fiber is clearly responsible for the success of 750 MHz.

3. Bandwidth–fiber has virtually unlimited bandwidth. Transmitter and receiver products are only bandwidth limited in the optical to electronic conversion circuitry.

4. Economics–fiber's growth has come from strong economics. Broadband operators can build hybrid fiber/coax (HFC) networks at a lower cost than a conventional coax network.

5. Reliability–fiber usage reduces the number of active electronic devices between the headend/CO and the home. This means fewer network outages and fewer subscribers affected by any one outage.

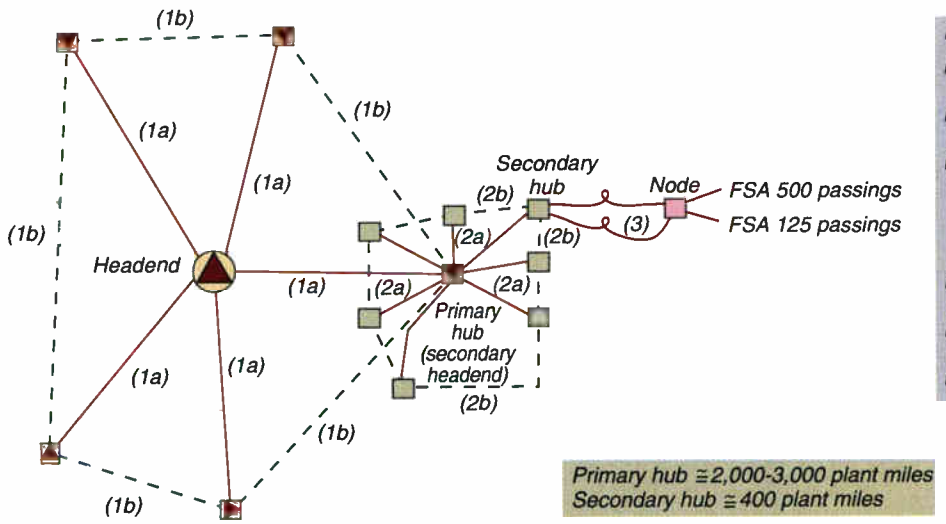
The heavy deployment of fiber optics into advanced broadband networks will continue for many years.

Figure 1 illustrates a typical HFC broadband architecture. There are two major segments to the network: (1) the interconnect where headends, COs and hub sites are linked to provide a point for final distribution of services to subscribers; (2) the Fiber to the Serving Area (FSA), where fiber and coax technologies deliver programming from the distribution hubs to small pockets of subscribers.

The fiber transmission technology selection in a network will be driven by the broadband operator's applications and business plan. That is, what services are to be offered to the subscribers? From there, the FSA architecture decision is made after considering bandwidth, signal performance and economic requirements.

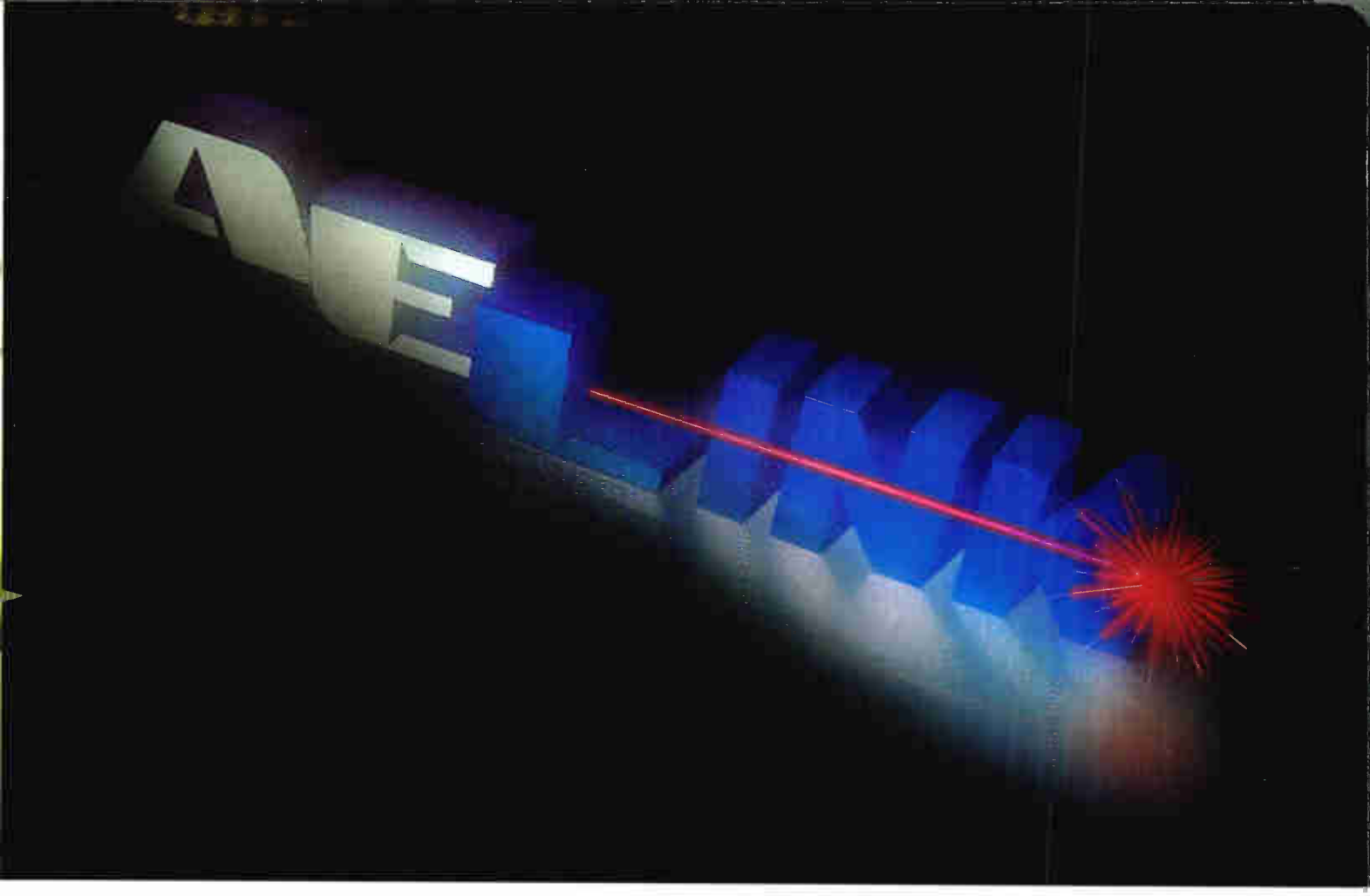
Interconnects will typically utilize digital or high power 1550 EMAT solutions as they support long distance transmission and ring redundancy. There are three types of fiber transmission technologies available for the FSA portion of the network. They are externally modulated amplified transmitters (EMAT), high power DFBs (HDFB) and low power DFBs (LDFB).

Figure 1: *Fiber interconnects/regionalized metropolitan area*



Broadcast vs. narrowcast

Table 1 (see page 32) compares the three fiber optic transmission technologies that are available to the broadband system planner. Each has its place in the



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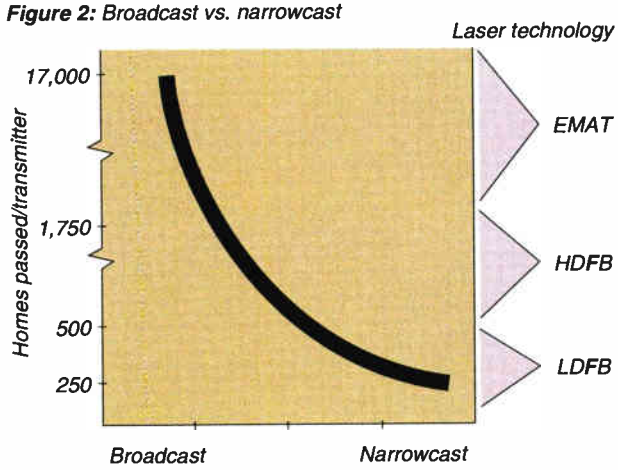
network, depending on the required business applications and selected architecture. Up until now, most broadband networks have utilized either EMAT or HDFB lasers for transmission of programming/services from the distribution hub to the subscriber serving area. Depending on the distance (optical loss) to the receiver node, each transmitter's output is optically split between two and four times with HDFBs, and 35 times with EMATs. Fiber cable is home run to this hub site, where the optical splitting takes place. Assuming 500 home pockets, homes passed per transmitter range from 1,500 to 17,000. This scheme is commonly referred to as broadcast transmission. That is, all homes served from a single fiber transmitter receive identical programming and services.

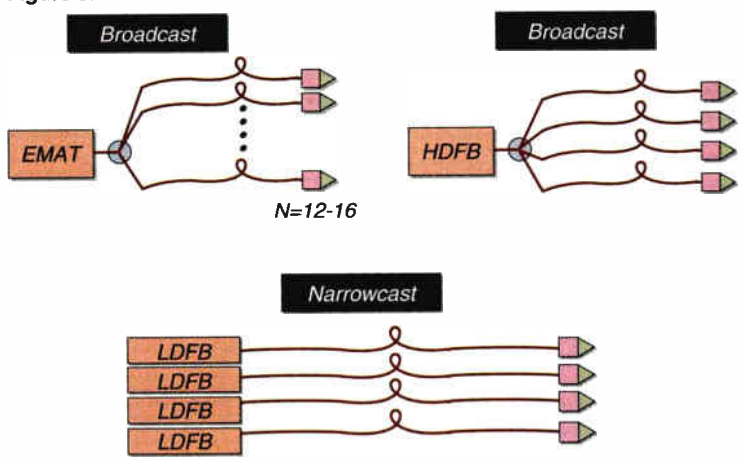
Figure 2: *Broadcast vs. narrowcast*



Alternatively, "narrowcasting" provides for a dedicated transmitter receiver link, where optical splitting at the hub site is eliminated. Narrowcasting allows the broadband operator to now "talk to" fewer homes per optical transmitter. Low power DFBs (LDFB) are designed with output levels equal to the actual glass link loss budget between the transmitter and receiver. As the industry moves toward a more interactive and transaction based business, both forward and reverse network traffic levels will increase. This will quickly drive an operator shift towards narrowcast transmission. Figures 2 and 3 contrast broadcast and narrowcast transmission schemes in Fiber to the Serving Area.

Finally, a move to narrowcasting will improve overall network reliability. A transmitter outage only affects 500 potential subscribers, compared to 1,500-17,000 in the broadcast scenarios.

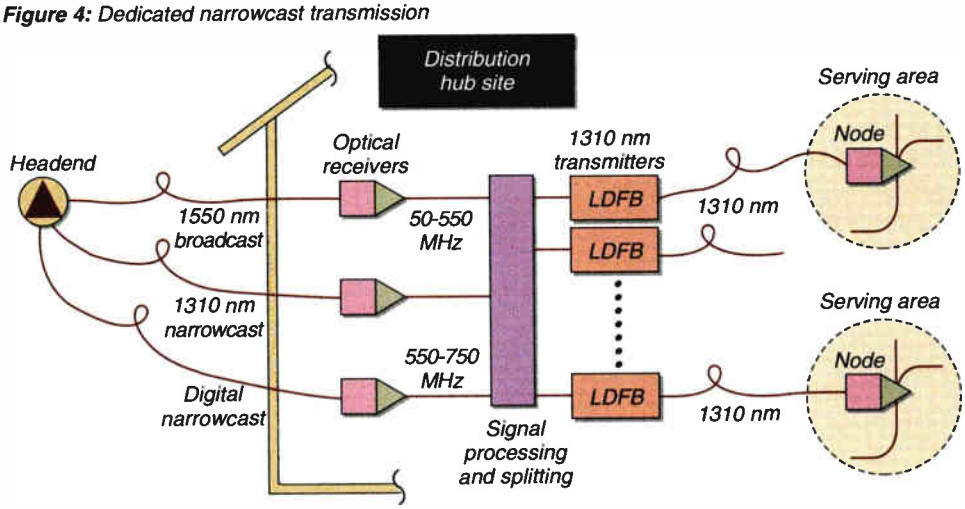
Figure 3: *Broadcast vs. narrowcast*



Narrowcast transmitter product

There are several important issues that fiber optic electronics vendors must consider in the development of a narrowcast product. They include specifications, packaging, features and economics. Typical 750 MHz specifications at the optical receiver are 52 CNR, -66 CTB and -62 CSO; the power of the DFB transmitter is selected based on the total (glass plus passive) optical budget. Historically, laser vendors have been pushed for higher power and improved noise and distortion specifications. This allows the broadband network planner a greater degree of optical splitting and a lower link cost. In a narrowcast environment, similar specifications (52/66/62)

Figure 4: *Dedicated narrowcast transmission*



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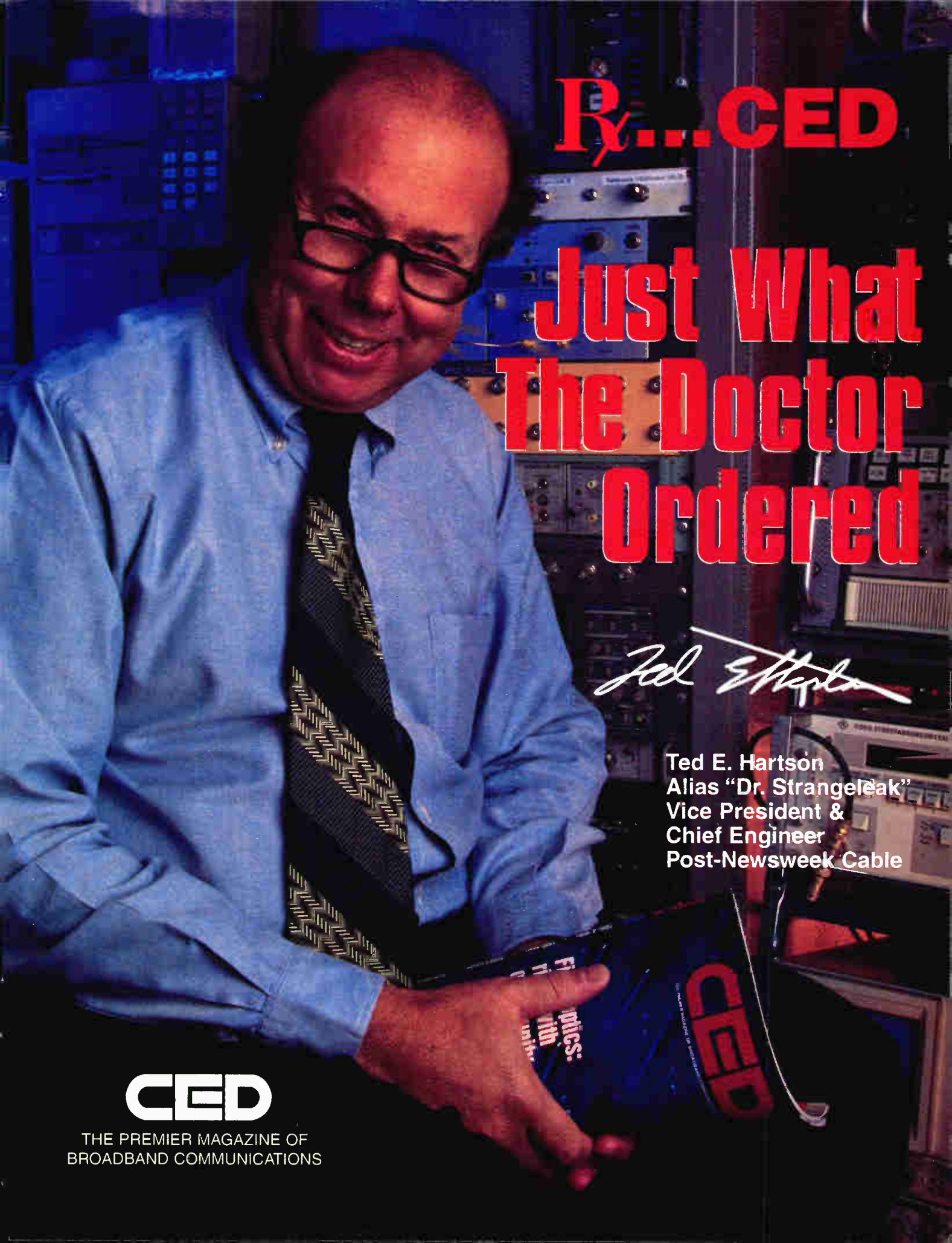
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Narrowcasted services might include analog off-airs and government access, as well as digitally formatted switched video

are still required from the transmitter as heavy analog transmission will continue to be present. The laser vendors are now focusing their efforts on yielding a lower power (2-5 mW) DFB product with the same specifications as the HDFB.

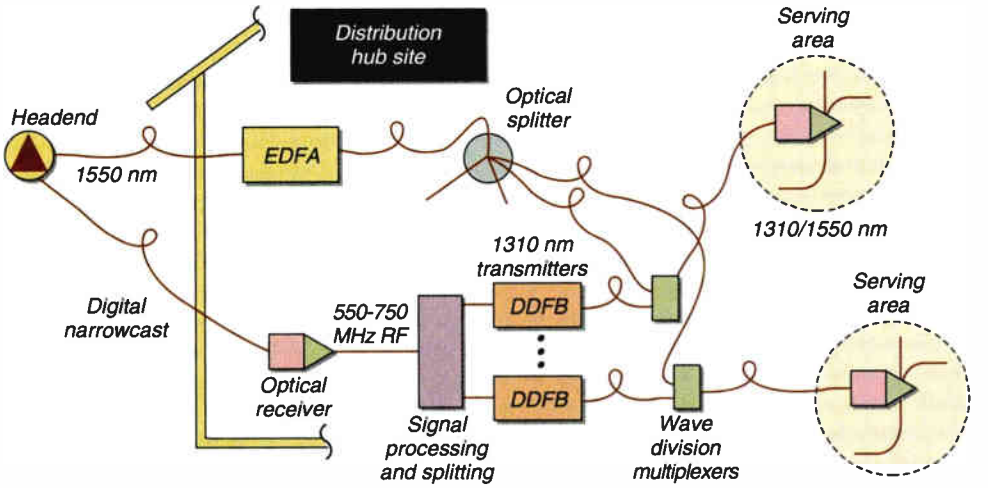
Narrowcasting will require more transmitters than a conventional broadcast scheme; perhaps four times the number of HDFBs and 35 times the number of EMATs. Hence, transmitter packaging and overall rack space requirements become a significant issue. Narrowcast transmitter platforms must become more densely packed and utilize shared resources such as power supplies and status monitoring.

As hub site rack space is limited, vendors must be innovative in the efficient design and packaging of narrowcast fiber transmitters, reverse receivers and power supplies.

Economics in narrowcasting is another significant issue. Manufacturers are working to achieve cost parity between four LDFBs and one HDFB and an optical coupler. The economic benefits of splitting HDFBs or EMATs must be partially recovered in a cost reduced LDFB product.

At least in the near term, narrowcast products will carry a cost premium; however, they will also offer considerable value to the broadband operator. Narrowcasting's inherent higher reliability and support of high traffic interactive services will soon become a network requirement.

Figure 5: Hybrid broadcast–narrowcast transmission



- *All distribution hub sites receive equivalent 1550 nm analog broadcast programming*
- *Hubs also receive unique 1310 nm digital narrowcast including voice, LAN, switched video*

Migration to tomorrow's network

Critical to any broadband operator's strategy is a network evolutionary path that will support potential new services. There are really two network strategies that may be followed going forward. Both approaches assume the delivery of analog video-only programming today, but plan for the rollout of interactive digital services in the near future. Interestingly enough, a hybrid of broadcast and narrowcast fiber transmission technologies is utilized.

The first approach, called "dedicated narrowcast," is depicted in Figure 4. Here it is assumed that 550 MHz (80 channels) of analog video is transported from the headend/CO to the distribution hub via 1550 nm optics. As previously stated, 1550 technology is excellent for interconnects and hubbing due to its long distance and redundant ring capabilities.

Inside the distribution hub, an optical receiver converts the 1550 light to 50-550 MHz RF. Also transported into the hub site on other fibers are the targeted or narrowcasted services required for this geographic area of subscribers. These narrowcasted services might include analog off-airs and government access, as well as digitally formatted switched video, voice and LAN networking.

Each hub site will receive narrowcasted programming unique to its customer base. The narrowcast services are optically received and converted to 550-750 MHz RF. The individual services can be recombined and reprocessed into as many narrowcast channel lineups as required. Finally, the 550-750 MHz narrowcast information is integrated with the 50-550 MHz analog programming at the 750 MHz LDFB narrowcast laser for transmission to the subscriber serving area. Dedicated 750 MHz LDFBs are deployed, one per optical receiver.

An alternative approach, called "Hybrid broadcast–narrowcast," is depicted in Figure 5. Again, it is assumed that 550 MHz (80 channels) of analog video is transported from the headend/CO to the distribution hub via 1550 nm optics. Inside the hub, the 550 MHz analog video is optically amplified using an erbium doped fiber amplifier (EDFA) and then optically split (12-16 times) for distribution to the individual subscriber serving areas.

Also transported into the hub site on other fibers are the targeted or narrowcasted services required for this geographic area of subscribers. These services are carried in the 550-750 MHz spectrum via 1310 nm optics and consist of digitally formatted voice, LAN and switched video. They are optically received and converted to 550-750 MHz RF. The digitally narrowcast services are then re-lased utilizing lower spec'd 1310 nm digital DFBs operating in the 550-750 MHz spectrum.

The DFBs referred to here are only loaded with 200 MHz of digital information, and hence, are different

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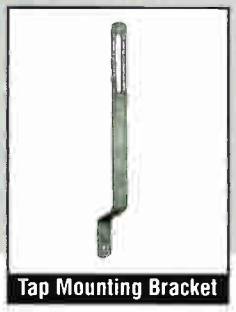
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Table 1: *Fiber optic transmission technology alternatives*

	EMAT	HDFB	LDFB
RF input (MHz)	50-750	50-750	50-750
Optical window (nm)	1310/1550	1310	1310
Typical power (mW)	20-40	10-12	2-4
Optical splits per Tx	34	2-4	0
Transmission type	Broadcast	Broadcast	Narrowcast
Typical homes passed per transmitter	17,000	1,500	500
Average transmitter price	$70,000	$12,000	$5,000
Price per link	$3,758	$4,800	$6,700

Assumptions
750 MHz forward only operation
500 Homes passed per receiver node
EMAT optical splits include EDFAs

than the low power analog LDFBs discussed above.

The 550-750 MHz output from the DDFB transmitters is then wave division multiplexed (WDM) with the 1550 nm 50-550 MHz broadcast programming onto a single fiber for transport to the subscriber serving area.

Pros and cons

Both dedicated narrowcast and hybrid broadcast-narrowcast offer advantages to the broadband network provider. Once again, the choice will be made based on applications and the overall business plan.

The author has completed several sample network designs in order to better understand the economics of these two alternatives (Table 2). The analysis indicates the hybrid broadcast-narrowcast scheme is less expensive (up to $400/mile) than a dedicated narrowcast approach. Typically, one would expect the operator to deploy 1550 nm optics for CATV broadcast during the initial network upgrade. The longer one can wait to install and activate the 1310 nm narrowcast tier, the more financially attractive this alternative appears.

The time value of money is a factor here. As an industry, cable operators are also betting that the narrowcast DDFB transmitters are relatively inexpensive uncooled lasers.

The dedicated narrowcast approach, while perhaps more expensive, offers several application advantages that should be considered.

Dedicated narrowcast allows for local ad insertion in the 50-550 MHz analog tier. As the analog programming is brought back to RF at the hub site, digital ad insertion utilizing local signal reprocessing and splitting equipment may be easily accomplished. Local ad insertion is a very important application and source of revenue for the broadband operator.

Additionally, franchise agreements may require that certain off-airs, local origination, and government access be available in certain areas of the system. This can only be accomplished via dedicated narrowcast. In the hybrid broadcast-narrowcast scenario, all analog programming passes through the hub at light.

It would be very difficult to signal process the 50-550 MHz spectrum to meet these special applications.

Table 2: *Fiber optic transmission model*

	Dedicated narrowcast	Hybrid broadcast/ narrowcast
150 EMAT/21 dBm EDFA		.006/$434
Low DFB transmitter	.24/$1,200	
Digital DFB transmitter		.24/$408
Receivers (fwd & reverse)	.24/$870	.24/$870
Splice enclosures	.067/$23	.067/$23
Transmitter driver amps	.60/$210	.307/$107
Fiber cable (6F/node)	731'/$1,157	731'/$1,157
Fiber install and electronics activation labor	$686	$681
Total cost per mile	$4,146	$3,687

Assumptions: 500 homes passed per node
550 MHz analog - 200 MHz digital loading
Fiber optics portion only
Units per mile/$ per mile

Summary

As new services and business applications become an integral part of the broadband network offering, narrowcast technology will play a greater role. The business plan will be a key driver as to which fiber optic transmission architecture and technology will be required.

It is extremely important that the network planner have in mind that next evolutionary step to support future services and revenue opportunities. In any event, narrowcasting should be a part of those plans. CED

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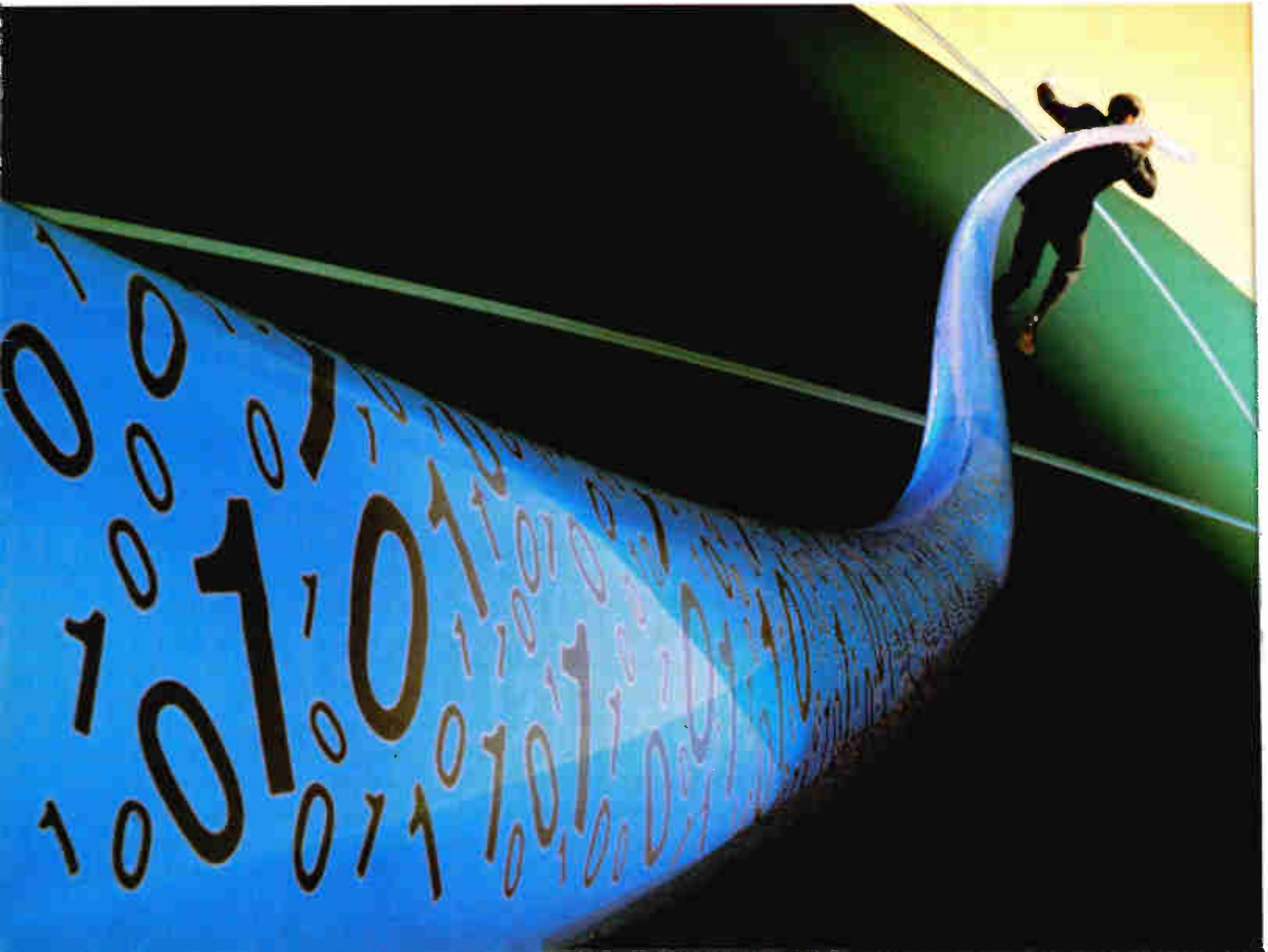
Getting close to the cliff

MSOs, manufacturers tackle the digital unknown

By Dana Cervenka

While it's true that MSOs have yet to deploy a single digital set-top, they are not waiting until digital video and telephony are really here to learn about the idiosyncrasies of testing the medium. On the contrary, many are soliciting a response from manufacturers to the most difficult testing and training challenge yet: to jump from the known world of analog testing, where a tech can diagnose the problem just by looking at a TV picture, to the unknown world of digital, where a picture will look relatively fine—right up until the point it disappears.

"I hate the term, but it's a paradigm shift," explains Ted Hartson, Post-Newsweek vice president and chief engineer. That shift means that in the world of 1s and 0s, intuitive testing will go out the window. "The artifacts, the unhappiness in the picture looks much different in a digital signal," adds Hartson. "Digital signals either freeze, or drop out."



The world of digital brings with it tests familiar to the analog domain, as well as some new measurements, including Bit Error Rate (BER), digital power measurements, channel performance, general spectrum measurements and constellation measurements. One new tool, constellation diagrams, depict the amplitude and phase of a digital signal at a particular instant in time, or over a period of time. By looking at a diagram of say, a 64 QAM signal, the tech can determine the quality of the modulation that is being sent over the cable. Eye diagrams also measure the quality of a digital signal, via a constellation analyzer: if a signal starts overlapping with itself, or in other words, the modulation becomes confused as to what certain symbols are (it can no longer tell the difference between a 1 or a 0), it forms something that looks like a human eye. As more interference degrades the signal, the "eye" will start to close.

While there does exist equipment today that is capable of testing the delivery of digital video signals, it is in neither the package nor the format that will be optimal for use by the cable television industry, says Hartson, who has suggested that manufacturers incorporate capabilities including a histogram of bit error samples into their digital testing boxes. For example, with a digital picture, the bit error rate gets worse and worse, until, in an overwhelming rush of errors, the signal would exceeds the maximum BER the forward error correction of the processing system can handle, and the signal plummets over the cliff—the picture is gone. A histogram of BER samples would illuminate the problem for the field tech by letting him know how close to the cliff the signal really is.

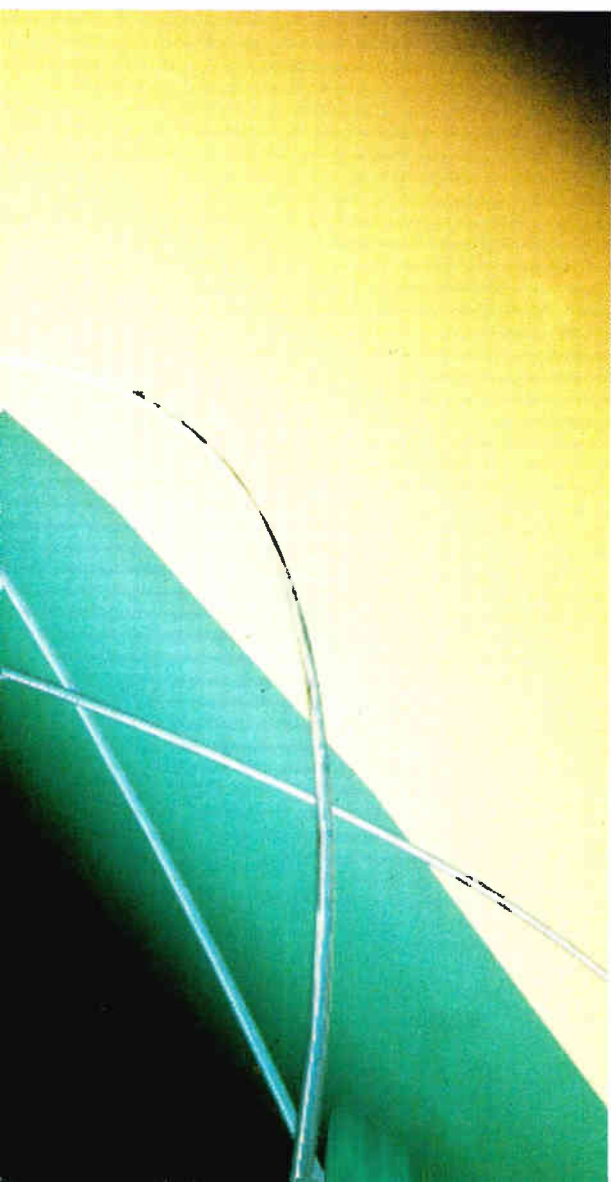


PHOTO BY RON LOWERY, THE STOCK MARKET

Phase one and phase two

Tele-Communications Inc. (TCI) is currently working with a total of six manufacturers on designing digital test equipment. Probably by the end of this month, the MSO will have chosen two companies to design its initial suite of products. While TCI would normally follow the RFI/RFP process, notes Ron Upchurch, senior project engineer with the MSO, in this case, there was no time. Why the haste?

TCI is racing full-speed ahead into what Upchurch calls phase one, or qualifying the system for digital transmission. The first phase of equipment will be used to simulate the actual signal, and thus determine if the plant is up to the task of carrying digital video and telephony. Phase one tests will include Bit Error Rate and Burst Error Tests. The latter will document errors that are bursty, even if they happen to be very short in duration, which might be caused by a power company switching relay, or one of the cable plant's power supplies switching on or off. The stage one equipment will be able to handle testing of both digital video and telephony, as well as Sega and DMX signals, with the attendant capability to measure QAM, QPSK, and 9QPR.

The first phase will determine if the plant is up to carrying digital video and telephony

The earliest the MSO expects equipment to be delivered is by late third quarter of this year, and that equipment will range in price from $10,000 to $22,000 per set. A qualification set would include a transmitter, otherwise known as a digital pattern generator, which simulates (in TCI's case), a 64 QAM signal, as well as receivers for each point to be analyzed.

The second phase of testing revolves around in-service equipment, which comes into play once digital signals are actually launched into the system. In its functionality, this piece of equipment will closely resemble a digital set-top. "The way we envision the in-service piece, is working very similarly to a set-top, but being portable, ruggedized, weatherproof and having some additional features built in," explains Upchurch. Referred to as an in-service digital monitor, the box's closest cousin would be today's spectrum analyzer; however, the monitor would have the same functions as a BER tester, and would include a built-in signal level meter, as well as the ability to provide carrier-to-noise and hum readings.

The in-service piece is aimed at both service technicians, and possibly even installers, if, says Upchurch, the cost can be driven down. Specs provided to manu-

facturers require that the new equipment be user-friendly—menu-driven, and featuring results that are relatively easy to analyze.

As for the in-service telephony equipment, it will enable line techs and service techs to troubleshoot problems with QPSK problems on the network.

The initial, qualification testing will encompass some 23 systems that TCI has earmarked for the launch of digital services.

The unreality of digital testing

While analog testing deals with a world that is mainly grounded in reality, digital does not. "In data, it's not a physical reality that you are looking at," says Jim Harris, product marketing manager, Trilithic. "What you are actually judging is the ability of the system to cope with errors."

A tech may be blissfully unaware that the digital signal he is monitoring is dangerously close to the edge of the falls.

One particularly thorny challenge for the manufacturers trying to develop digital test equipment is that they are dealing with a medium that encompasses numerous, proprietary hardware and software technologies. "Some of the algorithms associated with recovering the video information are proprietary," Harris elaborates.

Trilithic's offering to the digital test equipment market, adds Harris, is probably best characterized as being a compressed video analyzer.

And the ultimate challenge of making digital test equipment is the same as that of making digital settops, says Wavetek's Division Marketing Manager, Rick Jaworski: "To get the product to a price that people are willing to pay."

From the lab to the field

Hewlett Packard has been working with at least six MSOs during the past year-and-a-half on qualifying analog plant for digital services, focusing mainly in the areas of return path ingress, spectral characterization and bit error rate testing.

And recently, the manufacturer introduced the 89400 vector signal analyzer series, which has the capability to verify that the digital video data streams have been correctly modulated onto the RF carriers. The analyzer is also capable of conducting PCS (Personal Communications Services) and telephony testing, as well as digital video. The challenge facing HP is to migrate its considerable store of lab grade technology to a price that is appropriate and acceptable to MSOs, while at the same time, making the user interface more technician-friendly.

"A large part of HP's acquisition of CaLan," explains Bruce McPherran, market program manager with CaLan, "is to migrate HP's expertise in digital measurement to instrumentation that is more tech-ready, an area that HP, at least in cable, has not been in before."

New uses for existing gear

The transition to digital testing also means that existing test equipment will take on added functionality: specifically, spectrum analyzers, signal level meters, TDRs (Time Domain Reflectometers) and OTDRs (Optical TDRs) will be used to determine if a cable system is digital ready, according to Rick King, product line manager, Transmission Test, for Tektronix.

The next step for the test equipment manufacturer will involve incorporating additional features, and automating some of those features, to enable traditional instruments to make digital transmission measurements. "Our signal level meter has the capability of measuring the level of digitally modulated carriers," notes King. "And in that case, we are trying to integrate the mea-

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surements as much as possible to look like, and operate in the same way as the technician would [be used to] in working on an analog system, in order to ease the training burden."

The cabbage to signal quality ratio

Just how large will that burden be? For MSOs, the question becomes, will all of the intelligence be built into the box, or will it be necessary to have tiers of troops, each with differing levels of expertise and knowledge? Trilithic's Harris compares one scenario to IBM's approach to its field computer maintenance force in the days of the mainframe computer: "They had stock troops, they had mentors, and they had real gurus. The real gurus carried the heavy-duty equipment. The guys at the first level changed the fuses or banged on the side of it to see if they could make it work."

Ultimately, making digital work will require a much more directed, hands-on approach by MSOs' corporate management.

Tektronix's King confirms that the tiered approach makes good sense. "The higher level tiers can actually set up some of the measurements to be performed by the test equipment, which can be carried out into the field, if necessary, and used by some of the [junior] techs," he adds.

It will also be necessary to educate installers and techs that digital is particularly intolerant of poor cabling practices, says Ken Ainsworth, principal engineer with Tektronix, TV Test Division. As for phenomena like the previously mentioned "cliff," or "waterfall" effect, training will also be necessary to explain non-linear, digital relationships, such as that between output signal-to-noise, and input signal-to-noise, adds Ainsworth.

We need to be able to take techs and turn them into digital comm engineers

In an attempt to circumvent the training problem by incorporating as much intelligence into the equipment as possible, Hewlett Packard will continue its practice of providing test routines, or programs, on a ROM Card that can be inserted into a test instrument. Engineers and techs can then execute the tests in a repeatable, verifiable way. McPherran acknowledges, however, that some digital testing techniques will be more difficult than what techs are used to in the analog world.

"We have tools designed for electrical engineers," he notes, "and some people can't even afford to hire EEs. We need to be able to take techs who understand cable television very well, and turn them into digital communications engineers. And that's something that we *can* do."

McPherran draws an analogy to differential phase and differential gain, concepts which didn't even exist a few years ago, to demonstrate that there is hope of making the digital testing world a comfortable, familiar one.

"Some day, there will be a thing called cabbages," he jokes. "It sounds that unfamiliar to techs today when you talk about forward error correction or modulation error ratio. So 10 cabbages is bad, but 11.5, maybe that's good." CED

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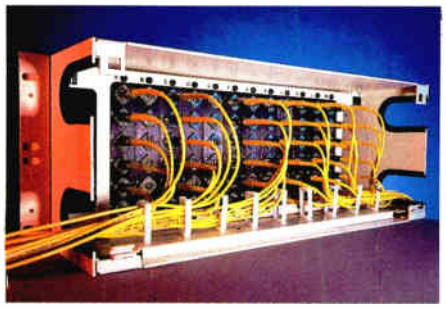

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Comprehensive testing of fiber infrastructures

Cutting costs, overhead

By Steve Grady, Program Manager, Broadband Service Assurance, ADC Telecommunications, Inc.

As cable companies begin to implement fiber optic backbones, they must face a simple fact: while just laying fiber may enable them to achieve the bandwidth required to support emerging broadband interactive services, unless a structured physical layer management solution is implemented as well, investments cannot be optimized. The reason is straightforward: with fiber cable outages costing upwards of $200,000 per hour, and average outage times of 1.28 minutes per mile of cable per year, a fiber management system that can shave even minutes off repair times can pay for itself in a few months, and go on to retrieve millions of dollars in otherwise lost revenues.

The keys to successful management of fiber optic and hybrid fiber/coax (HFC) infrastructures are comprehensive testing and online documentation of facilities. If problems can be diagnosed, and their locations determined swiftly, repair crews can be dispatched faster. The savings that accrue through this approach

Figure 1: *Remote fiber test and surveillance system*

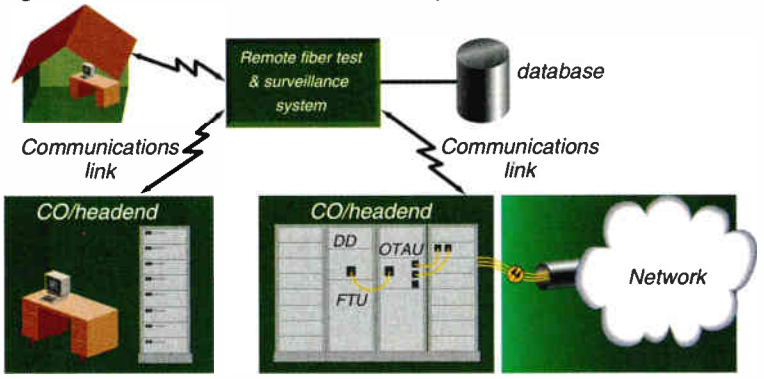
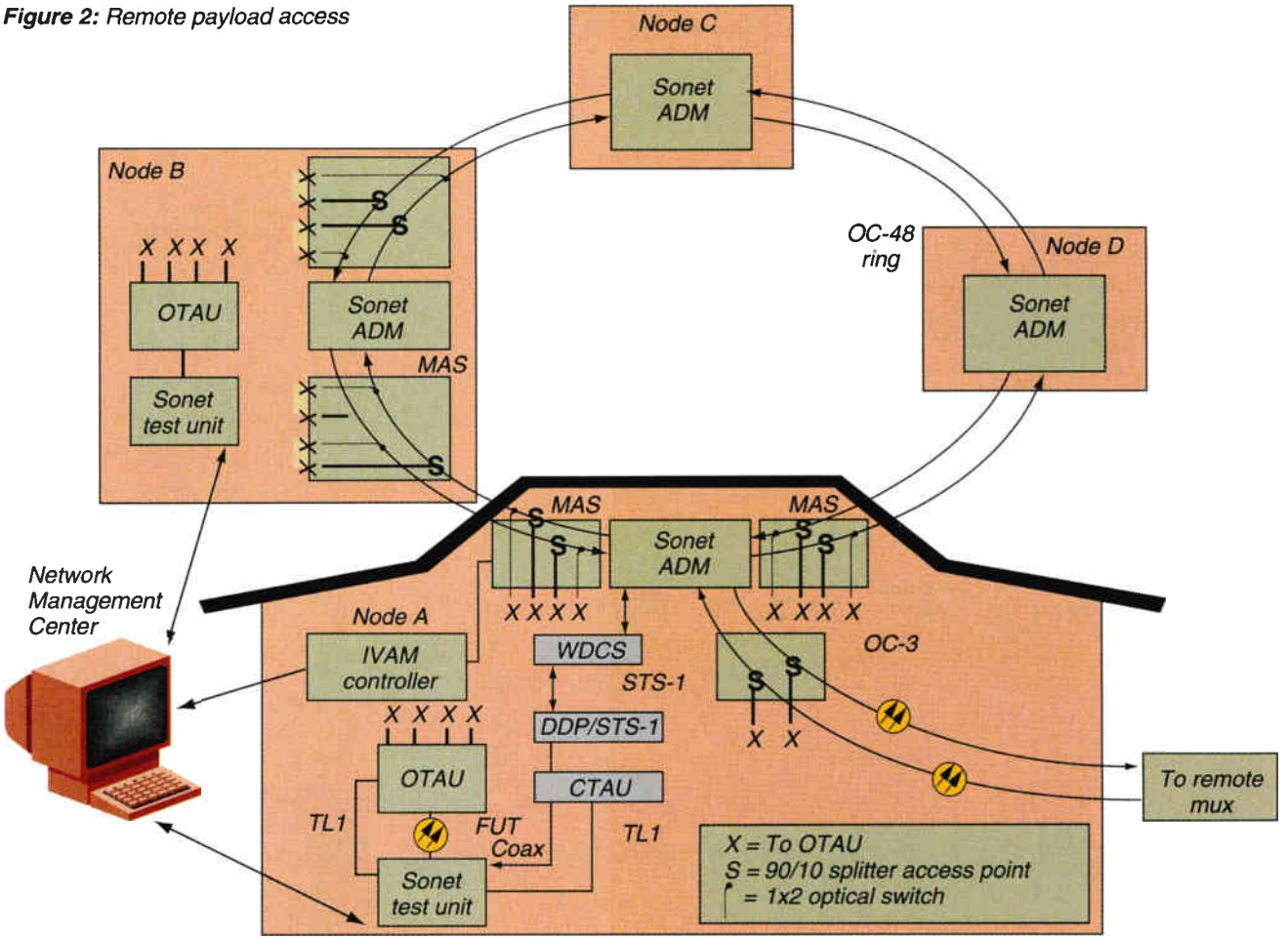


Figure 2: *Remote payload access*



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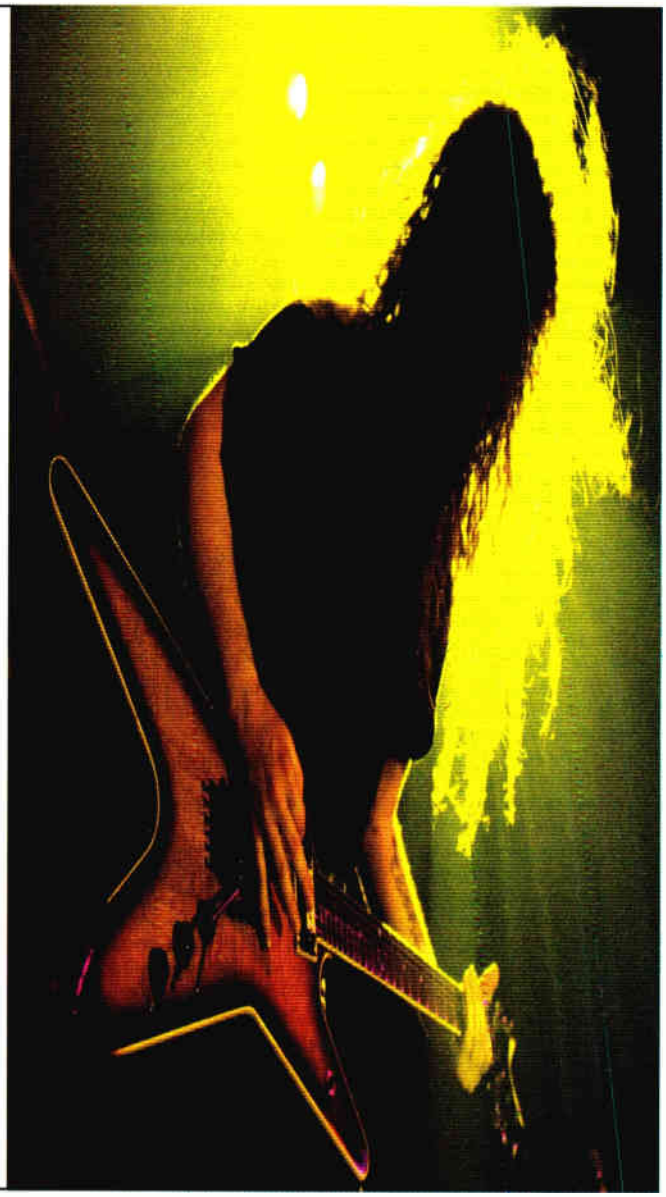

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are truly significant. According to a Bellcore study, it takes most cable companies an estimated one hour to dispatch a repair crew from the time a fiber cable cut occurs—or 20 percent of the average total restoration interval. But, by implementing automated testing procedures that can immediately diagnose and locate faults, repair crews can be dispatched in minutes, saving hundreds of thousands of dollars each time a fault occurs. Equally important, minimizing downtime will maximize customer service, the real key to prosperity.

While fully automated testing procedures will provide the greatest benefits, cable companies can also significantly trim maintenance overhead with manual testing procedures—beginning right at the time when the cable is being placed in the ground. For example, when making splices, or installing connectors, the integrity of the fiber run can be tested immediately—rather than waiting until all the fiber is in the ground.

Use of a calibrated laser source in each headend and then measuring the power transmitted at the end of the line with a handheld meter can help avoid these post-implementation repairs, and ensure that the network meets the pre-defined optical loss budget.

While a laser source and meter can identify optical losses, to fully characterize the network, and identify the reason for a transmission outage, optical return loss measurements are also required. These can be made with an optical return loss set or optical fault finder, also located at the headend. These devices shoot out light and then look at the backscatter to determine the characteristics of the splices and connectors in the fiber being examined.

To optimize performance of these tests and speed repairs, the laser source and optical fault finder should be housed in a fiber distribution frame at each headend. With this centralized access point for all fiber terminations, tests of specific fibers can be made more easily, and service restoration can be expedited. All too often, however, cable companies splice all fiber cable interconnections, and when it comes time to identify a termination, they are faced with a jungle of splices that must be unraveled before any test or repair action can be taken.

Online fiber documentation

In addition to adding test capabilities to the fiber frame, completely documenting, online, all fiber network components will also streamline maintenance activities. With an automated repository documenting the fiber plant end-to-end, test results can be easily interpreted and geographically pinpointed, and repair crews instantly dispatched.

Example RFTS payback model

Outage cost and frequency
Part 1--Estimate the cost and frequency of an outage:

1. *Enter the number of cable miles in the region = 14,000 miles*
2. *The number of hours of outage is calculated by 1.28 failures minutes/cable mile/year divided by 60 minutes or internal company records of fiber outage (will be lower than reality) = 299 hours/year*
3. *The variable cost/hour for a fiber cable failure = $150,000/hour*
4. *Multiply #2 by #3 to calculate the estimated cost of outages in the region = $44,850,000 /year*
5. *Divide #4 by #1 to calculate the cost per fiber mile of outages = $3,203/mile/year*

Fiber restoral savings
Part 2--Benefits of RFTS in fiber restoral

6. *Enter the % RFTS will reduce time to restore a cable to service = 20%*
7. *Multiply #6 times #5 to calculate RFTS operating savings = $640/mile/year*

RFTS operating cost
Part 3--Calculate the operating cost of RFTS on an annual basis per mile of monitored cable

8. *Enter burdened labor rate for your region = $115,000/staff-year*
9. *Enter number of control center staff that will be needed to run RFTS (3 for 24 hours) = 3 staff*
10. *Multiply #8 by #9 and divide by #1 to calculate RFTS labor cost = $24.64/mile/year*
11. *Enter the cost of deployed RFTS equipment = $8,000,000*
12. *Divide #11 by #1 by 5 depreciation years to calculate the yearly RFTS cost = $114/mile/year*
13. *Multiply #11 by .10 and divide by #1 to calculate yearly RFTS support cost = $57/mile/year*
14. *Add #10, #12, #13 to calculate total yearly operational cost of RFTS = $196/mile/year*

Payback analysis
Part 4--Calculate the annual $ benefit and payback period

15. *Subtract #15 from #7, multiply by #1 to calculate annual RFTS benefits = $6,216,000/year*
16. *Divide #11 by #15, times 12 months to calculate payback period = 15.4 months*

Online documentation provides another advantage to companies concerned with streamlining maintenance procedures. With paper records, each time a change is made to a network, the modifications to the documentation have to be made manually—a procedure that is, obviously, prone to human errors. But with online documentation, any change made is automatically rippled throughout the entire system. If the name of a specific section of cable is changed, for example, that change need be entered only once, and it will be automatically reflected wherever appropriate. With manual documentation procedures, all references to this section must first be identified, and then changed. If any references are missed, and the section subsequently needs to be located, lengthy delays could result.

Online documentation also supports rapid provisioning, an important issue in a market where changing customer requirements need to be continually addressed with new services. With an accurate picture of existing facilities and network capacity at all times, new services can be provisioned much faster than if the underlying infrastructure has to be repeatedly inventoried to ensure it can support the services proposed.

The need for online fiber plant documentation is also becoming increasingly critical as cable networks expand, yet continue to rely on a single operations center. The reason is that even if test results are available at this central site, they must be interpreted with a detailed map of the fiber infrastructure. But if this information is only available in multiple documents which may be scattered across multiple sites, repairs will be delayed.

Remote automated fiber testing

In addition to online documentation, to expedite remote test procedures, full-function OTDR-based fiber test units (FTUs) are coupled with optical test access units (OTAUs) to facilitate access to specific fibers on either a set schedule, or on demand. A communications link between the test system controller (TSC) and the FTU/OTAUs in the fiber frames is also required. With immediate online TSC access to testing information for virtually every fiber in the network infrastructure, as well as full topology information, exact problems—whether facilities or equipment—can be rapidly determined, and crews dispatched to the site with the required repair equipment (see Figure 1).

Automated testing also cuts installation labor costs. With each fiber taking as long as 10 minutes to characterize with an OTDR, paying a person to shoot each test and wait for results every time a test is required to locate a fault or determine network capacity can get expensive. However, for larger and expanding networks, an investment in automated test equipment may actually pay for itself by running all of these tests in a batch mode in the evening, and having the results available the next morning for interpretation.

With automated testing, dark fibers can be cost-effectively tested as well as active ones. As a result, excess capacity can be fully characterized, data stored, and the cable ready to go whenever new applications are required.

Fiber cable surveillance

Automated testing equipment that can characterize dark fibers is particularly useful in locating fiber sheath problems. Over 80 percent of all physical problems that occur to a cable sheath can be detected by analyzing a single fiber in that sheath. Continually moni-

toring both dark and active fibers therefore provides a cost-effective way to ensure fast service restoral.

To test active fibers, wavelength division multiplexers (WDMs) are required at each headend (and preferably integrated into the fiber frame) in order to test signals at different operating wavelengths. Equipment that performs these tests should also operate on-demand or in an automated surveillance mode. Proactive monitoring of dark and active fiber surveillance may also help identify potential network weaknesses before they actually result in service outages.

Fiber payload testing

A cable company that has set up a remote fiber testing infrastructure can now leverage this network to perform fiber payload testing. With the ability to remotely and non-intrusively test the actual content of Synchronous Optical Networks (Sonet), cable companies will be able to leverage centralized, experienced staff members to diagnose signals without duplicating resources at multiple sites, or facing the expense of opening fiber sheaths. This capability will also enable analysis of ATM and MPEG signals carried within Sonet payloads.

Remote payload testing is accomplished by leaking signals through a splitter, and diverting them, through an optical test access unit, to a Sonet test unit. Integrated with existing FTUs and OTAUs already located in the fiber frames at each headend, this equipment completes the suite of tests required for completely managing fiber plants (see Figure 2).

When selecting test solutions, be sure that communications capabilities are as functional as the tests themselves. Unless all test equipment and online documentation systems are linked to each and every headend with a UNIX-based client/server network architecture, inter-site communications simply cannot be optimized. And without communications, remote testing and enterprise-wide online documentation will just not work.

It is also imperative to recognize that all test equipment from all vendors may not perform individual tests equally well—or, in fact, even be mutually compatible. Therefore, when looking for test and documentation systems, be sure that the vendor can provide a comprehensive solution to your management needs.

With a systems solutions approach, tests can be added in a modular fashion, providing a seamless growth path from manual testing to fully automated remote test environments. In other words, by selecting a vendor that offers comprehensive end-to-end management solutions, as your needs expand, so too can your management capabilities.

The need for a structured management solution is precipitated by expanding cable networks and new customer requirements for interactive services. In this highly competitive environment, cable companies need to be able to maximize uptime, optimize service restoral times, and be able to quickly reprovision their networks in order to ensure that their customers get the services they want, when they want them. Armed with online documentation capabilities, as well as a full suite of manual and remote test equipment, this objective can be cost-effectively achieved. CED

The author wishes to acknowledge Bob Johnson of Laser Precision Corp. for his contributions to this article.

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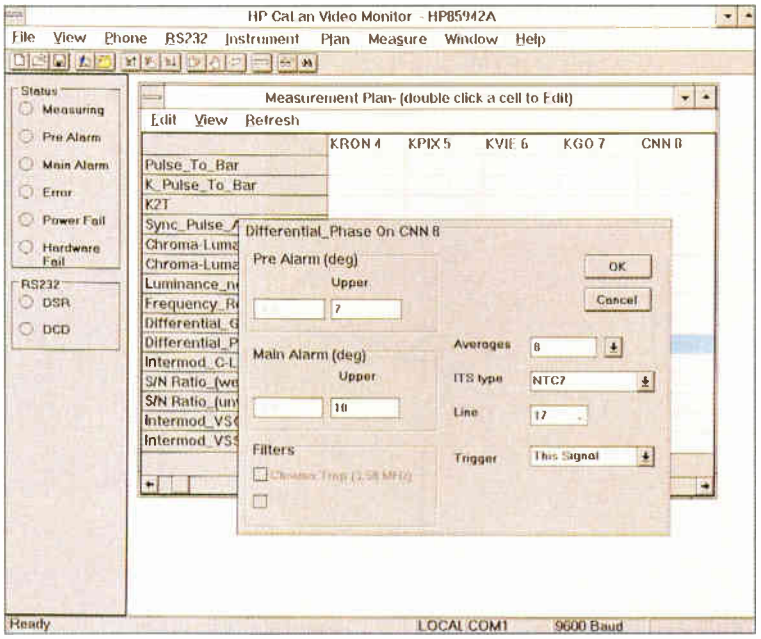
Beyond the basics of FCC test compliance

Video signal quality monitoring



For early warning of video quality impairments, measurement limits are set using the Windows interface of the video signal monitor.

By Bruce McPherran,
Market Program Manager, HP CaLan

There are two ways to view the FCC video proof-of-performance testing requirements, commonly referred to as the "color" tests. At first glance, they may be seen as bothersome regulatory intrusions that must be tended to once every three years to meet minimum requirements. However, in today's competitive marketplace, the regulations are really a wake-up call for improved signal quality control.

While video signal measurement requirements must be observed, improved full-time video signal monitoring can also lead to improved customer satisfaction and retention. Compact-dish satellite systems are already giving consumers a quality signal alternative to wired cable systems, and competition from the friendly local telephone company is on the way. Telcos are promising the quality of digital signals and the freedom of dial-up program choice. To keep and add subscribers in the face of this formidable competition, cable TV systems must make maximum efforts to deliver an uninterrupted, high-quality signal and responsive customer service.

The possibility of losing business to competitive delivery systems is only one indicator of the false economy of reliance on the cable TV industry's historical video signal quality monitor, the customer complaint call. This long-time "minimum standard" has never been the low-cost solution it may seem to be. Poor signal complaints from customers tend to increase during the peak viewing evening and weekend hours. This creates the need for reactive, rather than proactive, service calls at inconvenient and/or premium-pay times.

One of the key benefits of an investment in video signal measurement gear is that it can provide early warnings of signal degradation.

Most cable TV engineers and technicians are well aware of the benefits of improved video signal monitoring. There is probably much less awareness of the dollar cost of the training, time and tools necessary to meet FCC requirements and go beyond the basic standards to provide continuous monitoring of other important signal quality indicators. If a cable TV system is to maximize the cost-benefit ratio of a video test and measurement program, a number of questions must be answered. Which of the dozens of possible video signal tests are the most necessary? How many employee hours will it take to train staff on the new equipment? How will new headend video measurement gear integrate with existing equipment? How much time will it take to run tests and evaluate the results?

Since cable TV systems do not generally have unlimited funds, staff time and rack space, it is necessary to determine the most important video signal measurements, and to seek a means of making those measurements in the easiest, most cost-effective way possible.

Continuous monitoring

Staff time for training, testing and evaluating results often constitutes a major portion of monitoring expenses. This underscores the importance of ease of equipment set-up and use. Equipment that performs continuous measurements on an automated basis and generates alarms to warn of signal degradation eliminates the need for employee time to make periodic tests or read printouts that report normal operation. In addition to saving on labor costs, automated operation provides assured measurement reliability, eliminating any chance of subjective reading or variable techniques that can affect manual testing.

Equipment-related signal degradation is often a gradual process, so video signal monitoring equipment should permit recording, store, recall and manipulation of test data.

Compatibility with existing test gear is another consideration. The ability to compare, store and recall data from the devices along the signal path in the same manner simplifies data evaluation and makes it easier to pinpoint problems. Upgradeability to changing video standards is another important consideration.

Fortunately for cable TV systems with limited budgets, a few basic measurements can provide the information engineers need to deliver premium signal quality. The three FCC-mandated video measurements are differential phase, differential gain and chrominance-to-luminance delay inequality tests. Differential phase distortion can cause improper color changes when there are changes in brightness, usually in high-luminance areas. Differential gain error changes the amplitude of the chrominance signal, causing color distortion. Chrominance-to-luminance delay error causes blurred objects, especially in the red-orange segment of the color spectrum.

While the three required tests offer a general indication of cable TV system performance, a few additional measurements can provide virtually all the information needed to deliver

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the best possible video signal. Pulse-to-bar ratio is one of the critical measurements. A weak video signal (below 100 IRE) will become muddy and have poor contrast. Video signals above 100 IRE can cause an annoying sync buzz in the audio.

Video signal-to-noise (S/N) is also a key measurement. A signal can register good carrier-to-noise and still deliver a poor picture because of poor video S/N. Signal-to-noise reveals the noise injected into the cable TV system by satellite receivers, modulators, processors, scramblers and descramblers. By comparing video S/N before and after a modulator, technicians can determine that particular modulator's contribution to the video S/N ratio, then determine whether the problem is bad C/N or bad S/N.

Frequency response testing determines how flat the frequency response of modulators, processors and satellite receivers is. If a component is not flat, signal amplitudes become distorted. When a component attenuates higher frequencies, the high frequency rolloff reduces fine detail resolution. High frequency peaking, caused by a misaligned component, shows up on video as overly emphasized edges.

Chrominance-to-luminance intermodulation, also known as crosstalk, is present when luminance amplitude is affected by superimposed chrominance. This non-linear video distortion appears as luminance variation in strongly colored parts of the picture.

Luminance non-linearity is amplitude distortion resulting from a component's inability to uniformly process brightness information over the full 100 IRE amplitude range. When it is present, the picture displays poor resolution between brightness levels.

None of these video signal problems are likely to be discovered by a cable TV operation testing exclusively in the RF domain. Baseband test equipment capable of performing the basic tests just described will permit detection and correction of most video signal errors, providing premium-quality signals for today's improved TV sets.

Clear signals keep customers

Cable TV managers who still need convincing that video signal monitoring equipment is a sound investment should consider this: during the past year, half of the 600,000 families who bought compact satellite dishes had access to cable TV. That means 300,000 households opted to pay around $1,000 up front, plus monthly fees. Clearly, consumers have shown they are willing to make a serious cash commitment for a quality signal and a broad choice of channels. The one millionth compact dish unit was recently sold, triggering the contract clause that opens the market to hardware competition. That will mean lower prices.

While satellites have sold surprising well, they appeal primarily to innovative consumers with a penchant for the latest high-tech toys. The majority of consumers either can't afford or don't want to pay for the hardware, installation and maintenance costs of a satellite dish. They would prefer to rely on their local cable TV system to own and operate the equipment that delivers TV signals to their homes, as long as the system operator delivers a quality product. These customers are the cable TV industry's to satisfy or lose. Cable systems that provide a quality signal, responsive customer service and a positive community presence can forge and maintain a competitive edge over orbiting satellites and the unproven alliance of telephone companies and television. CED

Now's not the time to be scratching your head with questions.

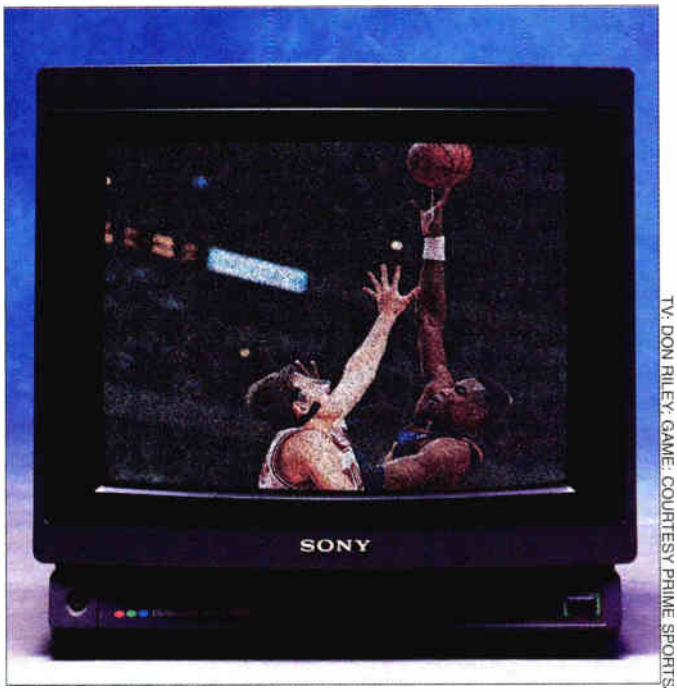
There is a better way.

HEWLETT PACKARD

Optimizing the return path

Easier and more effective return maintenance

By Jim Harris, Product Marketing Manager, and Dan Rittman, Engineer, Trilithic



TV: DON RILEY; GAME: COURTESY PRIME SPORTS

Many of the new cable services now being planned require some degree of interactivity between the service provider and the subscriber. For those applications where real-time communication is not required, such as pay-per-view ordering, communication via phone lines is adequate. For applications requiring more complex and immediate communications, the cable operator must rely on his system's return path.

Keeping the return path in reliable operating condition presents some special challenges. First, it typically operates in the 5 to 30, or 5 to 40 MHz range. Thousands of CB, ham radio and shortwave transmitters operate in this part of the spectrum, many at high power, and any weakness in the system's shielding will allow these signals to enter the system and interfere with upstream "traffic."

Second, the return architecture itself compounds difficulties. Return path branches converge as they travel toward the headend or node, making them effective "interference concentrators." Noise or ingress problems in one branch of the return system can disrupt traffic on many or all of the other branches. Weak ingress from a single source (a shortwave transmitter, for example) entering the system in several places will merge into a single, strong ingress as branches converge.

Third, since most return problems get worse as branches converge, the only meaningful place to measure return performance is at the headend, just before the upstream data is recovered. This is inconvenient, since any problems that are observed at the headend must then be corrected in the field.

Before discussing the equipment and methods needed for dealing with these complexities, it may be well to review typical distribution systems in which they will be used.

Review of return system architecture

Figure 1 shows a typical modern bidirectional distribution system. The downstream fiber carries forward signals from the headend or hub to "nodes," each of which serve 500-1,000 subs through a conventional coax distribution network. Return signals from the subs, typically in the range of 5-40 MHz, are transmitted by the node to optical receivers in the headend. The RF outputs of the receivers are combined in groups, each group driving a "modem" which recovers the upstream data and transmits it to the computer. How many receivers are connected to each modem depends on the amount of return "traffic" the system carries, and the typical ingress and S/N ratios of the return paths (the dirtier the return, the fewer receivers per modem). Figures 2a, 2b and 2c show several configurations.

Return path performance parameters

Reliable upstream performance depends on two parameters:

✔ Adequate signal-to-noise ratio (S/N ratio). Gain in a particular branch, if set either high or low, can adversely affect the signal-to-noise ratio in some part or all of the return system. If set low, signals on this branch might be "swamped" by the noise of other branches; if set high, noise on this branch might be amplified enough to interfere with signals on other branches.

To minimize noise-induced communications errors, upstream data systems use robust modulation schemes such as Quadrature Phase Shift Keying, typically operating at a data rate of 1.544 Mbps.

Assuming QPSK as the modulation format, for an acceptable BER of 10E-5, the return system must provide a S/N ratio of at least 10 dB, as measured in a 1 MHz bandwidth around the data carrier center frequency. Incorrect gain settings in some or all of the return paths degrade the S/N ratio, and hence the BER, of the return system.

✔ Adequate signal-to-ingress ratio. Again assuming QPSK is used, the sum of all ingressing signals lying within the data signal bandwidth (approximately 1 MHz for the data signal discussed above) must be at least 20 dB below the level of the data signal. As the sum of ingressing signals exceeds this level, it gradually degrades the BER performance of the system. At ingress levels approaching -10 dBc, communication is completely disrupted.

It should also be noted that the various kinds of intermodulation products that afflict the forward path are much less a problem on the return path, since far fewer carriers are present. Carrier frequencies can also be selected to keep those intermodulation products that do occur from falling within the data carrier bandwidths.

Return path testing and measurement

Like any other aspect of system maintenance, return maintenance has three parts:

✔ Proper installation and initial setup of the return path.

✔ Regular monitoring to detect problems that get worse with time.

✔ "Disaster control" for problems that appear suddenly.

Executing all three activities will be simplified if an adequate number of test points are

installed in the headend that allow the technician to monitor his system and connect test equipment conveniently. Ideally, a directional coupler should be installed at the input of every modem, and at the output of every return fiber receiver that lacks a built-in test point. To simplify measurement calculations, the test points should be padded so that the same signal is presented at all test points.

Sweeping the system

As noted above, return signal-to-noise performance depends on the gain and balance of the return path, so proper return alignment is crucial. The primary instrument used to balance the path is a return sweep system. These are available from several test equipment companies, but all employ the same general measurement strategy. Briefly, each system has two elements, a "field unit" and a "headend unit." The headend unit is connected, usually through a combiner, to the output test points of some or all of the return fiber receivers. This allows the field

Figure 1: *Typical 2-way CATV architecture*

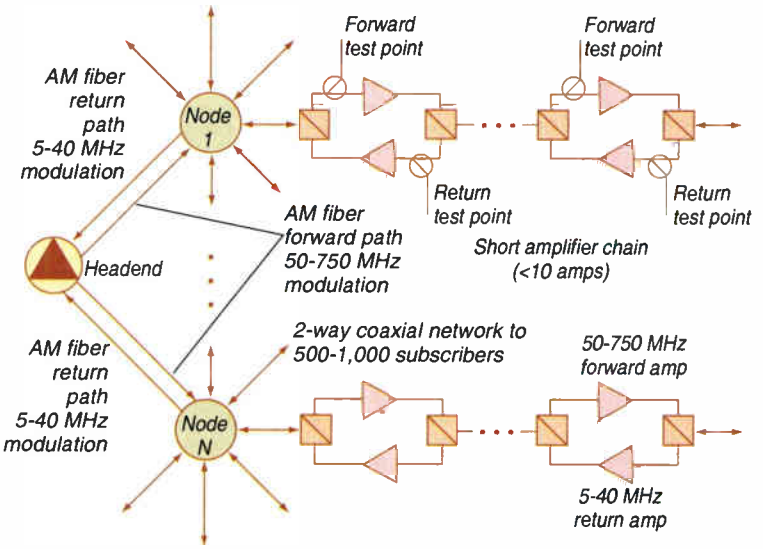


Figure 2a: *One modem per node*

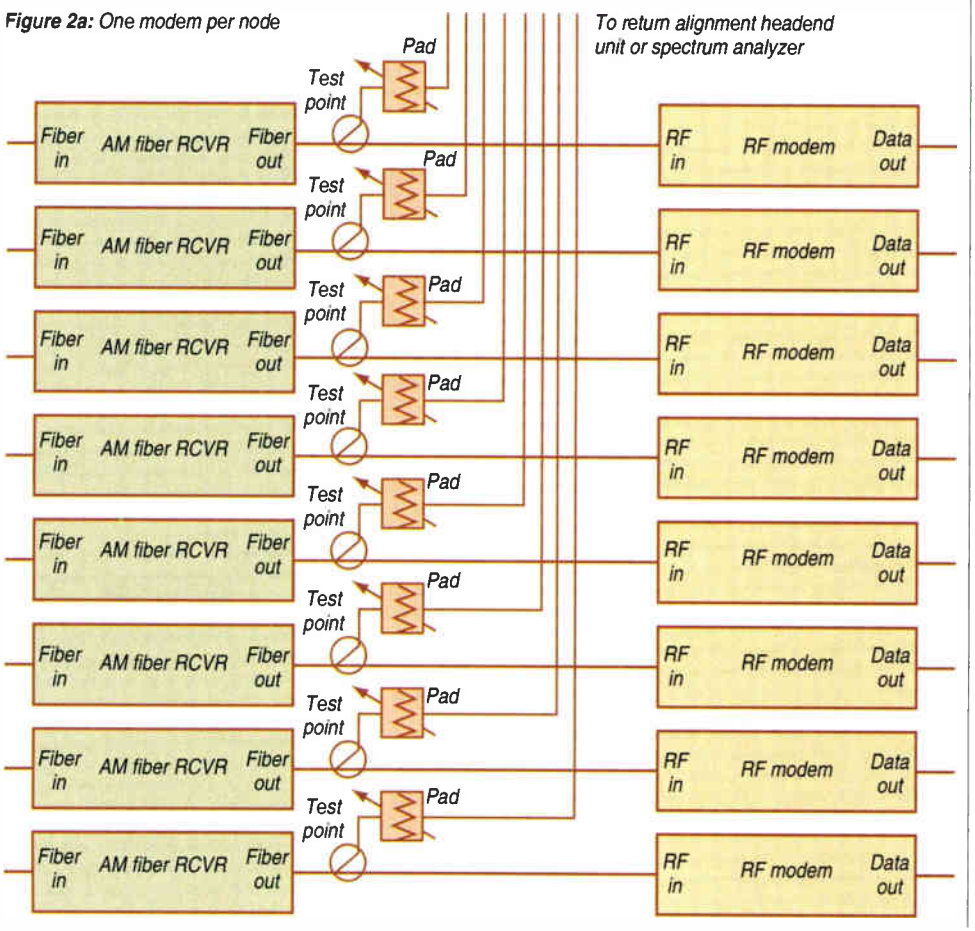
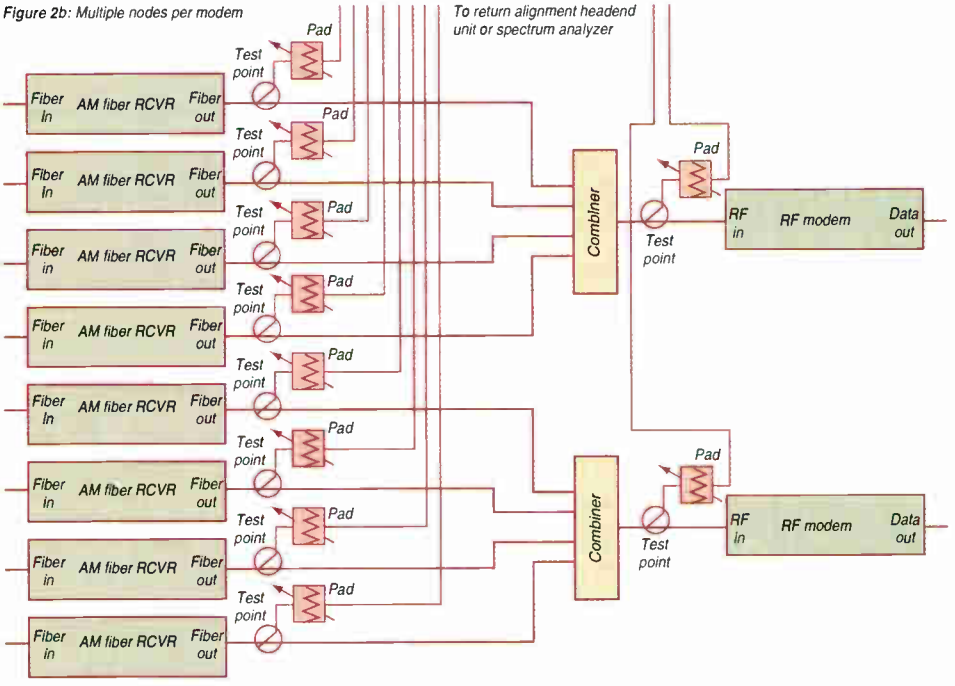


Figure 2b: Multiple nodes per modem



technician to move from node to node without returning to the headend to reconfigure the headend unit. Since the noise from all optical receivers is combined before the signal is input to the headend unit, the maximum number of receivers that can be connected to the headend unit depends on the received system noise level. Accurate measurements require a S/N ratio of at least 10 dB in the measurement bandwidth. If no test point exhibited a S/N ratio worse than 10 dB for all return signals (It would normally be much better), a single headend unit could monitor up to 32 fiber receivers with full accuracy. (The test point "manager" built into the headend unit enables it to analyze signals from each of eight test points individually or as a group.)

In operation, the field unit transmits several frequencies upstream to the headend at calibrated levels, the headend unit measures the arriving signals, and communicates the result to the technician in the field via a downstream carrier. Starting at the node, the tech connects the field unit to each amp's upstream test point and adjusts the return amp until the headend unit reports via the downstream carrier that it

Figure 2c: One modem for all nodes

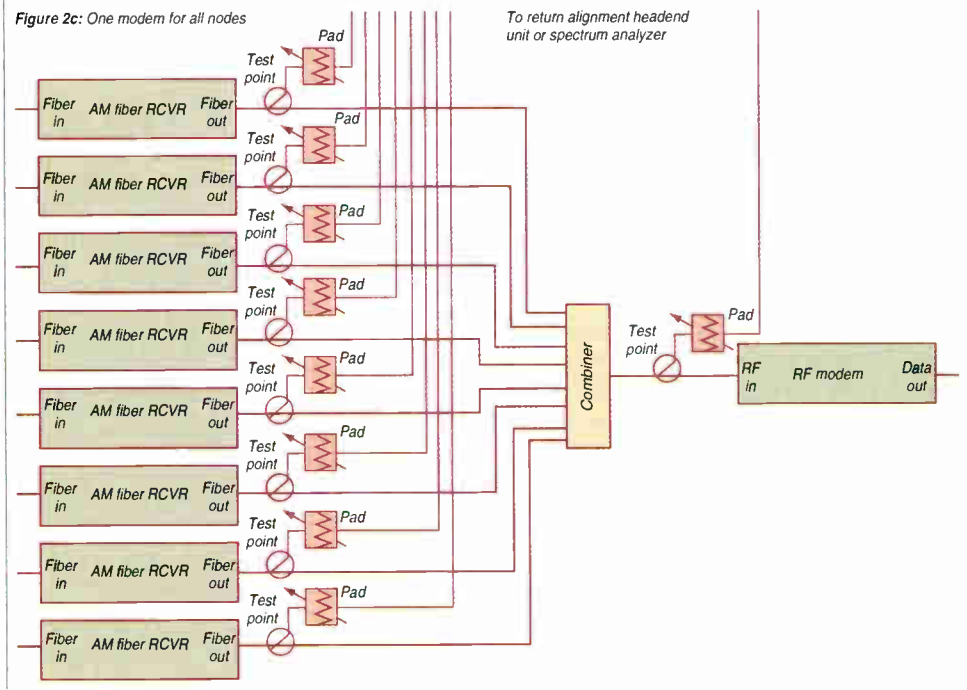


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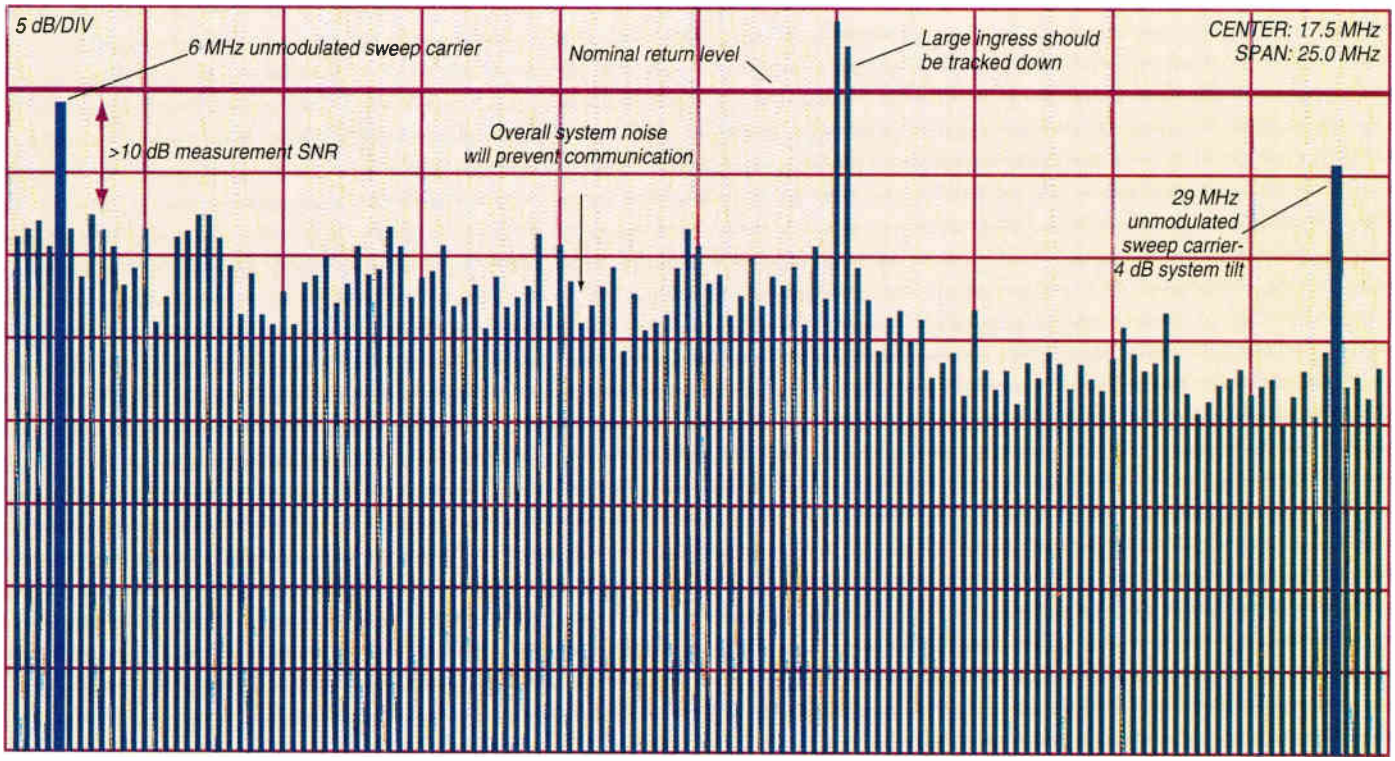
Figure 3b: Corrupted return spectrum



do so gradually, so regular monitoring of all return paths for increasing levels of noise or ingress, using the headend unit or a spectrum analyzer, will generally identify problems before they become serious. Remote measurements at unattended headends can be made at intervals using the headend unit or a data logging SLM and reported via phone lines.

In even the best managed system, the unexpected occurs, and operators have learned to live with it. It is worth noting, however, that minor accidents that would affect only a few subs in the downstream direction may disrupt hundreds of homes on the return path. For instance, suppose a motorist hits a utility pole near the end of a feeder branch, breaking the cable. The loss of downstream signals would affect only a few subs; in the return direction, ingress entering the cable break could disrupt every home on that node.

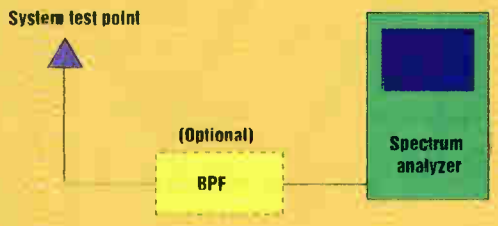
If the unexpected can't be avoided, it can be provided for. Regular monitoring will flag outbreaks when they occur, and plenty of test points will allow the affected node to be identified quickly. From there, the general test methods and equipment described earlier will help the field tech fix the problem as quickly as possible.

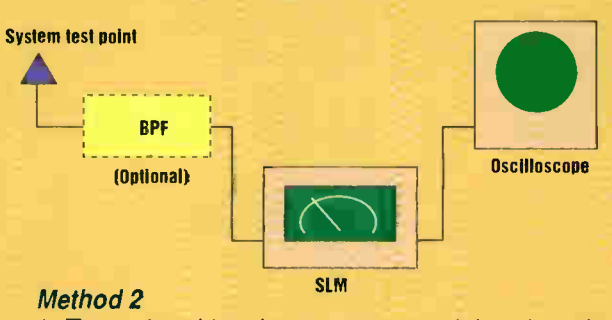
Keeping the return system in good operating trim requires an appreciation of its unique failure modes and the specialized methods and tools needed to deal with them. Problems can be minimized through a systematic performance monitoring program. CED

CED

Modulation Distortion at Power Frequencies (Hum)

Standard: Not to exceed 3% of visual signal level





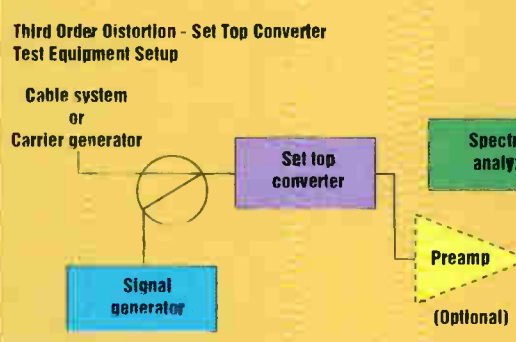
Method 1

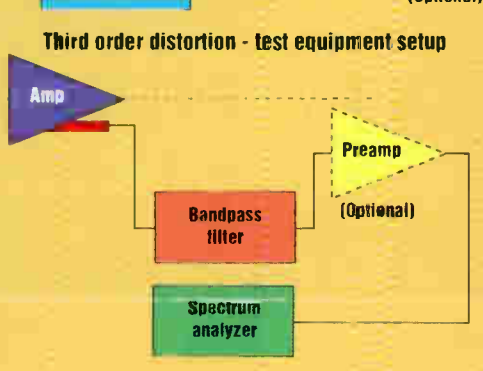
1. Tune spectrum analyzer to modulated or unmodulated test carrier. Recommended settings: Resolution bandwidth, less than 10 kHz; sweep time, between 5 and 50 milliseconds/div. Required settings: zero span and linear display.
2. Temporarily remove signal. Verify display line is at the bottom. Use zero span and linear display settings.
3. Reapply signal. Adjust gain to place trace near top of display.
4. Refer to spectrum analyzer display and use formula below to determine distortion.

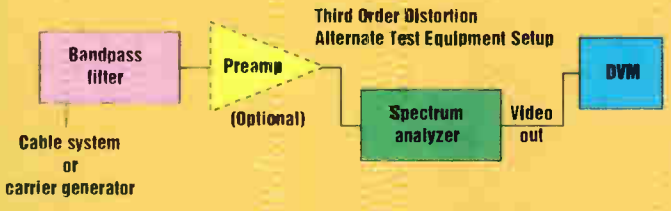
$$\text{Modulation distortion} = \frac{\text{Vp-p (hum)}}{\text{Vp (RF signal)}} (100\%)$$

Method 2

1. Tune signal level meter to unmodulated carrier under test.
2. Temporarily remove from oscilloscope and adjust trace with vertical position control to coincide with bottom graticule. Reapply signal.
3. Adjust oscilloscope vertical gain control so that trace peak is near top of display. 0.1 volts/division (DC coupled) and 5 milliseconds per division is recommended.
4. If hum signal is very small, it is acceptable to switch to AC coupling and a more sensitive vertical scale on the oscilloscope for a more accurate reading of the peak-to-peak voltage.
5. Use formula at left to determine distortion.







RF set-top 3rd order distortion

Note: A signal generator is used to generate a carrier off
1. Adjust spectrum analyzer to following settings: IF resp width, maximum; scan width, 5 MHz; Log scale, 10 dB/d ment. Adjust analyzer's center frequency to position set-
2. Adjust analyzer's full-scale reference to position carrie
3. Using the analyzer's markers, record the level of the c full scale reference to place the carrier exactly on the up
4. Readjust settings to: IF resolution bandwidth, 30 Hz; v width, 5 MHz; sweep time, automatic for calibrated meas
5. CTB and CSO will be visible above the carrier, offset b (or graticules) to measure peak level.
6. Distortion magnitude is difference, in decibels, between this (typically about 70 dB) is combined with system distortion to d

System 3rd order distortion • Method 1

1. Set analyzer as follows: IF resolution bandwidth, 200 kHz or MHz; Log scale, 10 dB/div.; Sweep time, automatic for calibrat
2. Adjust analyzer center frequency to position visual carrier o
3. Adjust analyzer's full scale reference to position sync peak
4. Use markers to record peak sync level of carrier, or adjust f graticule line, then record the full scale reference value.
5. If measuring CTB, turn off carrier. If measuring CSO, modul
6. Readjust analyzer to: IF resolution bandwith, 30 kHz; video b time, automatic for calibrated measurement; vid
7. If carrier is off, display shows both CTB and C level. Magnitude is difference in decibels betwe er level recorded in Step 4. CTB is located on th below the carrier.

Method 2

1. Set analyzer as follows: IF resolution bandwid scan width, 500 kHz; Log scale, linear.; Sweep t
2. Adjust analyzer center frequency to peak the set-top's visual carrier output.
3. Adjust analyzer's full scale reference to position the carrier near the top of the display. Analyzer's atten
4. Set analyzer's scan width to 0 MHz.
5. With DVM set to DC, record voltage of carrier reference level. Set DVM to AC and record level of CTB i on carrier. Distortion magnitude is determined by using formula at right. (If hum is present, results will be

Special Note: *An alternative method for performing this measurement can be made with th*

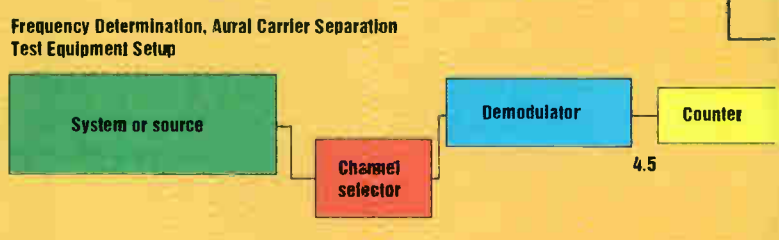
Aural Carrier Center Frequency

Standard: 4.5 MHz ± 5 kHz at terminal and output of modulating/processing equipmrnt

Aural carrier center frequency

Read the 4.5 MHz subcarrier output of the demodulator directly on the counter. Best results are achieved with no modulation on the sound carrier. If this is not possible, choose a long gate time on the counter. Some automated test equipment will perform this test without need for the demodulator.

Note: The demodulator output may have to be amplified to provide the frequency counter with sufficient signal strength.



CED '95

Cable Television

Proof of Performance Wall Chart

1993 was the first time since 1985 that American cable television systems were required to meet specific, federally enforced technical standards of performance. The requirements were negotiated by the cable television industry in conjunction with a consortium that represented the nation's local franchising authorities, then established as law by the Federal Communications Commission.

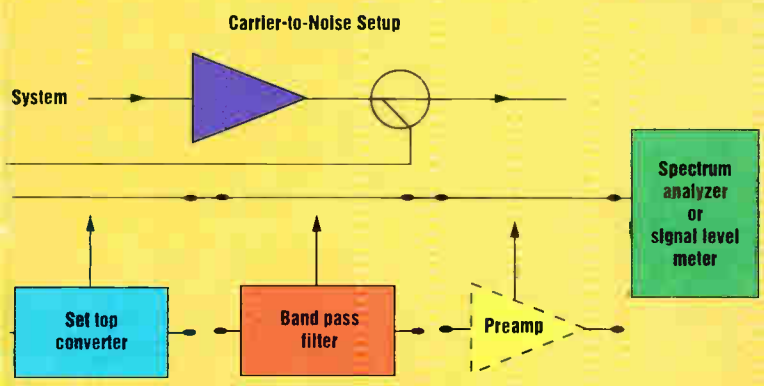
The proof of performance standards, as they have become known, are the important benchmarks by which cable systems are now judged. This wall chart graphically illustrates how to perform each proof test, with step-by-step instructions on how to set up the test and gather results. Of course, this chart should be used as a guide only. Because of the complexity of some of the tests, not every detail, hint, note and caveat could be included on the chart. Therefore, the ***NCTA Recommended Practices for Measurements on Cable Television Systems*** should be consulted for more information and for a full explanation of each procedure. This year, the chart has been updated to include a preview of digital signal testing, and also takes on new significance now that the color tests are required to be performed.

CED magazine and the advertisers who sponsored the chart are pleased to provide this information as a focal point of excellence in performance.

Proof of P

Visual Carrier-to-Noise Ratio

Standard: Not less than 43 dB



If using a spectrum analyzer:

1. Adjust analyzer as follows: IF resolution bandwidth, 300 kHz; video bandwidth, 300 kHz minimum; Log scale, 2 dB/div.; frequency span, 1 MHz; sweep time, automatic.
2. Center the signal on the screen by fine tuning the center frequency. If using a tunable bandpass filter, set the signal one to two divisions down from top of screen and tune the BPF to peak the video carrier.
3. Adjust the reference level to set the peak video carrier at the top graticule line. Record tne carrier level reference.
4. To measure the noise, adjust the settings as follows: IF resolution bandwidth, 30 kHz (wider bandhs can be used); video bandwidth, 100 kHz desired; Log scale, 10 dB/div.; frequency span, 6 to 10 MHz; sweep time, omatic. Tune center frequency to center the signal on the screen.

emove carrier or modulation, disconnect antenna lead or access to baseband video and terminate the input. Do not ply remove power from the processor, preamp or modulator.

une analyzer center frequency 2 MHz above the visual carrier frequency to center noise measurement range on een. Record number of dB between noise at center frequency and the top line reference. This is uncorrected carrier-to-se ratio (+dB). Subtract the following correction factors: +21.25 dB; +2.5 dB; IF noise equivalent BW; and noise-near-se (see NCTA Recommended Practices for a full explanation and examples).

If using a signal level meter:

1. Set SLM attenuator to get an on-scale meter reading.
2. Record carrier value.
3. Tune SLM frequency 2 to 3 MHz higher than the carrier (if CW) and remove attenuator until the minimum tunable noise level can be used. If carrier is modulated, it must be turned off at headend or modulation must be removed.
4. Record the noise level using compensating factors or switches
5. The difference between the level in Step 2 and Step 4 is the carrier-to-noise ratio.

Special Note: *An alternative method for performing this measurement can be made with the use of some automated test equipment.*

Distortions

d: Not less than 51 dB for standard systems, t less than 47 dB for HRC/IRC systems

set 250 to 500 kHz below normal visual carrier level.
lution bandwidth. 200 kHz or greater; video bandiv.; Sweep time, automatic for calibrated measureop's visual carrier output to center of screen.
r in upper division of the display.
arrier. If analyzer doesn't have markers, adjust the per graticule line, then record this value.
ideo bandwidth, minimum (less than 300 Hz); scan surement; video averaging (if available), on.
y the same frequency as visual carrier. Use marker

level and the level recorded in Step 3. This level etermine distortion level at subscriber's terminal.

greater; video bandwidth, maximum; scan width, 5 ed measurement.
test channel in center of screen.
evel in upper division of display.
ull scale reference to place sync level on upper

tion must be turned off.
bandwidth, minimum; scan width, 5 MHz; sweep eo averaging (if available), on.
SO. Use marker or graticules to measure distortion en average peak level of the distortion and the carrie carrier; CSO is either 1.25 MHz above or 0.75 MHz

h, 200 kHz or greater; video bandwidth, 30 kHz; me, automatic for calibrated measurement.

uator should be set to 0 dB

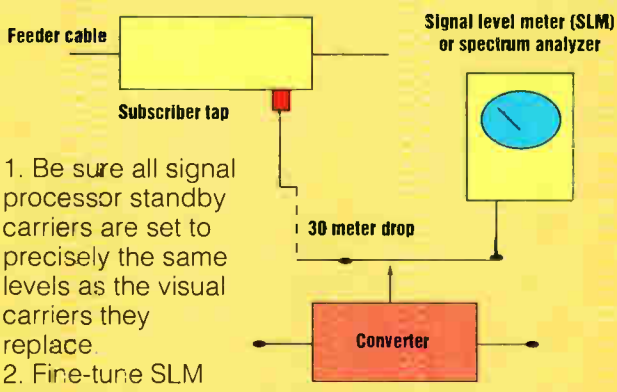
mposed affected.)

$$CTB = 20^{*} \text{ LOG } \frac{VOLTS_{AC}}{VOLTS_{DC}} + 0.5 \text{ dBc}$$

e use of some automated test equipment.

Visual, aural carrier level

Visual, Aural Carrier Level: 24 Hour Variation Test Equipment Setup



1. Be sure all signal processor standby carriers are set to precisely the same levels as the visual carriers they replace.
2. Fine-tune SLM to visual carrier to be measured. If applicable, adjust the SLM compenor as shown on its calibration chart.

Insert or remove attenuation from the SLM precision attenuator until the SLM reads within its linear region the dB scale. Re-tune the SLM as necessary to find the peak amplitude of the channel's visual carrier.

Record the measured compensated visual carrier level. Record the air temperature, time and date of measement.

Fine-tune SLM to the channel's aural carrier and remove attenuation until the SLM reads within its linear region the dB scale. Fine-tune again as necessary to find peak amplitude of channel's aural carrier.

Compute and record the aural carrier level with respect to its associated visual carrier level.

Perform the test in the headend for all active channels and at each system test point at the output of the -top terminating a 30-meter drop. Remeasure the visual carriers three more times at six-hour intervals.

Freq

Overall using pr

Note: This grammer sion varia tions. It is

1. Tune to Using the field selec lines of bo waveform noisy or ro each burs ing 3.58 M the effects antennas the origina form moni
2. Calcula ing formul

$$\frac{1}{2}\left[20 \text{ Log}\right.$$

3. If the response of the headend, added to th response variation (assuming headend and d ly measured), is not greater than ±2 dB, no fu required on that channel.
4. Tune to the next channel to be measured a

Note: Because this test measures overall resp nal source, if this test fails, individual system independently. See NCTA Recommended Pra system variations specifically on modulator ch

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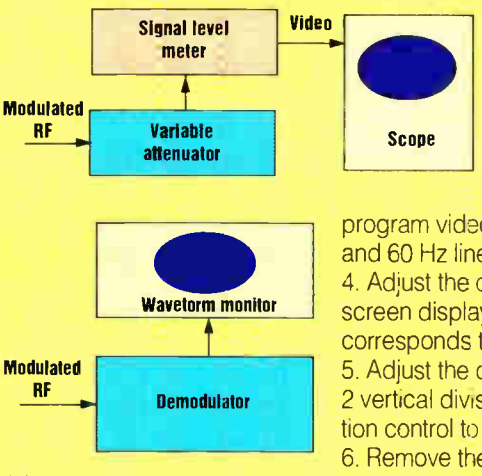
Cable Television
Performance

Color Parame

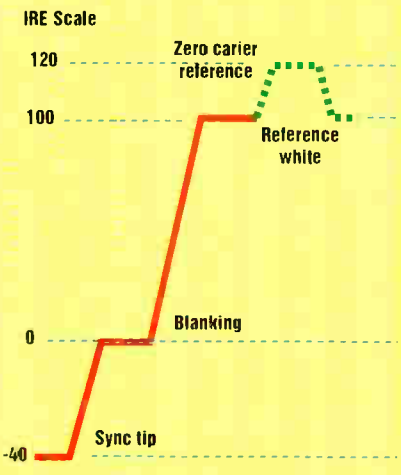


Depth of modulation

Using a signal level meter

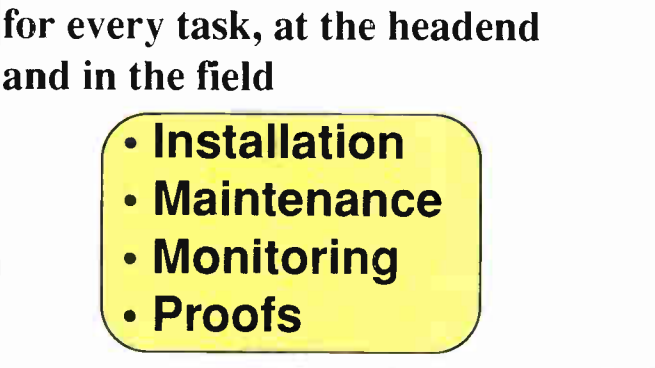
1. Connect the equipment as shown. Set the variable attenuator to 0 dB.
2. Adjust the SLM attenuator/sensitivity controls for maximum video output without c sion.
3. If a waveform generator is to supply the modulating signal, set the oscilloscope s rate to 20 microseconds per division with internal sync to display two horizontal line program video being measured, use 2 milliseconds/division and 60 Hz line sync to display one field.
4. Adjust the oscilloscope vertical sensitivity control for a full screen display. Set the attenuator to the decibel value which corresponds to the desired modulation percent.
5. Adjust the oscilloscope vertical sensitivity to obtain a 1 to 2 vertical division waveform amplitude. Use the vertical position control to place the sync tip at the graticule center line.
6. Remove the attenuation, but do not alter the vertical sensitivity and position control settings. Now adjust the percent modulation until the negative video peaks just reach the graticule center reference line.

Note: If the picture contains high color information, a slightly lower modulation setting may be necessary.



Using a demodulator and waveform monitor

1. Use the envelope detection mode in the demodulator to minimize any effects of incidental phase modulation present in the modulator.
2. Turn on the demodulator's zero reference carrier pulse. The pulse is typically on line 20, but can be moved to other lines. The correct depth of modulation is show in the illustration.
3. Use the monitor's variable gain if necessary to position the zero carrier reference pulse on the zero percent mark and the sync tip o percent mark. (See diagram above.) Adjust the percent modulation until the white level is at the 12.5 percent mark. This corresponds depth of modulation of 87.5 percent.



Differential gain. Standard: Not to exceed ± 20%.

1. Connect the output of the video signal generator to the select the modulated stairstep (five or 10 steps) as the tes
2. Adjust the output level of the modulator to be within the limits and with a pad, ensure that the input levels to the de fied limits.
3. Adjust the video modulator control on the modulator to depth of modulation.
4. Adjust the video output level from the demodulator to 1 observed on the waveform monitor. Place the response m monitor in the bandpass fi ter position. This display will no subcarrier signal with the luminance signal removed.
5. Using the linear IRE scale on the waveform monitor, note the variation in the chrominance subcarrier level and e age or ratio in decibels as indicated.
6. A vectorscope may be used to obtain a direct reading in percent. Connect the output of the demodulator to the brate the instrument by selecting the vector display.
7. Using the gain control function for the input channel being used, adjust the vector display so the vector dot repr carrier amplitude is on the inscribed circle on the graticule.
8. Select the gain function on the vectorscope and read the differential gain directly off the graticule provided (larg of the signal as measured in percent).

Note: See the NCTA Recom ples as well as a complete methods.

Special Note: *An altern these measurements can b automated te*

iency Response

system response test, ogrammer VITS

test measures the total of pro- response variations, transmis- ions and test equipment varia- a worst-case test.

the first channel to be tested. waveform monitor's line and t controls, examine the first 20 th fields to see if a multiburst is available and usable (not lled off). Record the levels of t in IRE units, up to and includ- lHz. Level variations will include of the original transmitter, and everything else in between l VITS generator and the wave- tor.

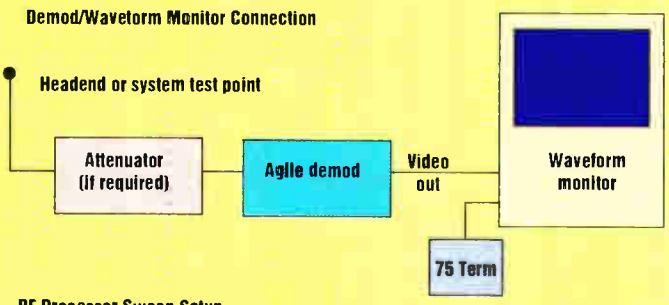
te the response using the follow- a:

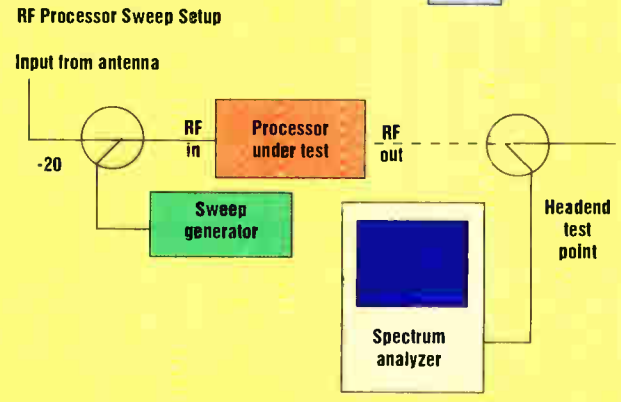
$$\text{Response (dB)} = \left(\frac{\text{Maximum Burst Amplitude}}{\text{Minimum Burst Amplitude}}\right)]$$

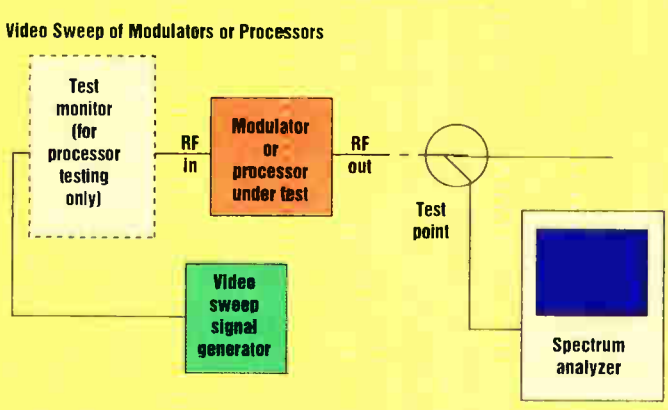
ıe distribution system in-channel istribution systems are separate- rther measurements are

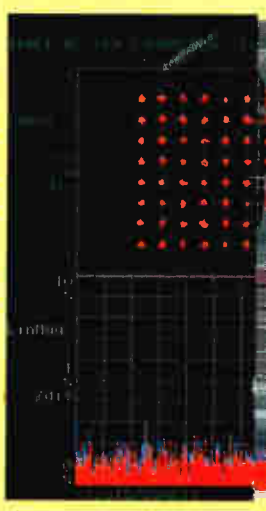
nd repeat these steps.

onse, including the original sig- components should be tested ctices for info on measuring annels and off-air channels.









Quantitative measure vector magnitude (EV degradation caused

Instantaneous EVM c troubleshooting.

Graphic courtesy of Hewle

Wall Chart

ers

ompres-

weep
s. If it's

Depth of
nodulation
- 0%
- 12.5%
- 75%
- 100%

n the 100
o a

input of the modulator and
t signal.
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modulator are within speci-

produce an 87.5 percent

volt peak-to-peak as
ode switch on the waveform
w show the chrominance

xpress it as either percent-

vectorscope input and cali-

esenting the maximum sub-

est peak-to-peak excursion

mended Practices for exam-
explanation of the testing

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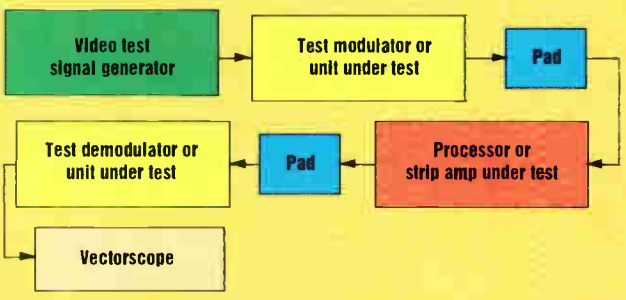
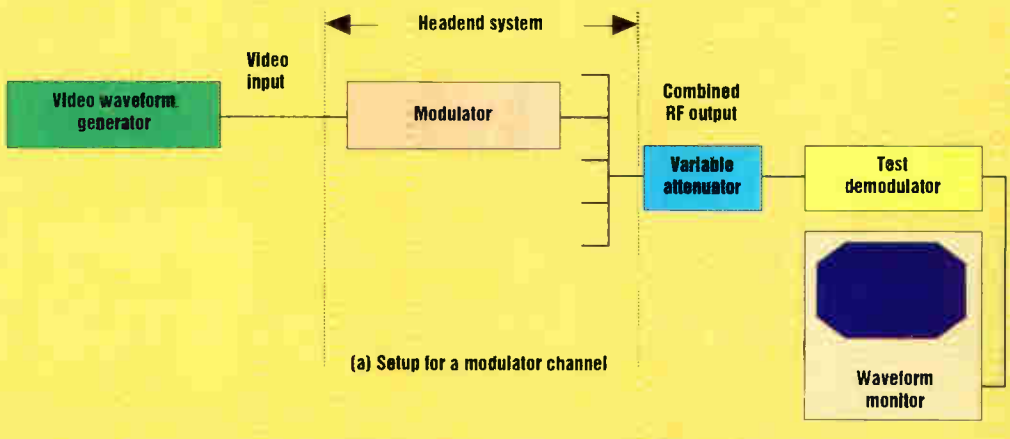
st equipment.



Differential phase. Not to exceed ± 10 degrees.
1. Connect the output of the video signal generator to the input of the modulator and select the modulated stairstep (five or 10 steps) as the test signal.
2. Adjust the output level of the modulator to be within the unit's specified operating limits and with a pad, ensure that the input levels to the demodulator are within specified limits.
3. Adjust the video modulator control on the modulator to produce an 87.5 percent depth of modulation.
4. Adjust the video output level from the demodulator to 1 volt peak-to-peak as observed on the oscilloscope. Disconnect the demodulator output from the oscilloscope and connect it to the input of the vectorscope.
5. Calibrate the vectorscope and adjust the vector display so the vector dot representing the maximum subcarrier amplitude is on the inscribed circle on the graticule.
6. Select the differential phase function on the vectorscope and using the phase knob on the channel being used, bring two extremities of the double phase display, visible on the graticule, together. (The calibrated phase shifter should be set to zero).
7. Annul the phase shifts on the scope graticule by bringing together the other extremities of the double display. Read the differential directly off the calibrated phase shifter.
Note: As with Differential Gain, this test should be made with the APL of test signal varied from 10 percent to 90 percent. The worst case is then taken as the proper value. See the NCTA Recommended Practices for a full test explanation.

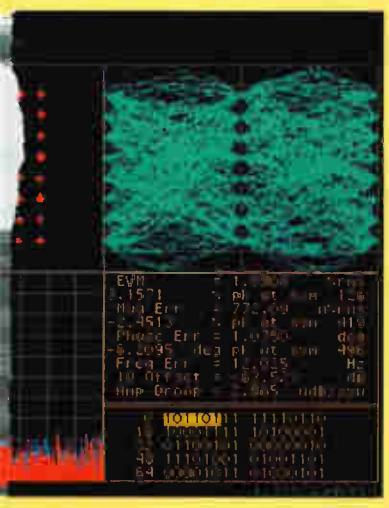


(a) Setup for a modulator channel

Chrominance-luminance delay inequality. Stanard within 170 MS.
The test set-up varies depending on whether the test uses a modulator, RF processor or demodulator. This example shows a test set-up using a modulator.
1. Set the video waveform generator to deliver a full-field 12.5T modulated sine-squared pulse and adjust the modulator for the normal depth of modulation.
2. With the demodulator set for normal video output level, adjust the waveform monitor to display the chroma pulse. Adjust the vertical sensitivity such that the pulse baseline-to-peak amplitude is 100 units.
3. Determine the chrominance-luminance delay inequality using the formula or nomogram.

Note: See the NCTA Recommended Practices for additional information and test set-ups.

Digital Video Testing



The next generation of testing requirements will focus on optimizing system performance for both digital video and telephony, in addition to traditional analog TV. As a glimpse into that not-too-distant world, presented here are some significant measurements for digital video.

Assuring the quality of digital video signals involves measurements that are distinctly different from those used with analog video. At RF, for example, the key tests and specifications are much more like those developed for use in the digital RF communications industry.

A vector signal analyzer can display the quality of QAM- or VSB-modulated signals using either traditional qualitative or newly-developed quantitative formats. Qualitative measures such as the constellation (top left) and eye (top right) diagrams are used to quickly visualize signal quality. Signal-to-noise problems are reflected in the clarity of the patterns, while linear and/or non-linear distortion affects pattern symmetry.

s, including the data table (lower right), show the demodulated binary data and tabulate average error
/M) A precise, repeatable measure of modulation quality, EVM is sensitive enough to show the signal
by even a single amplifier stage in a network.

an also be displayed as a function of time (lower left) or frequency, providing insights useful for network

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channel Surfing

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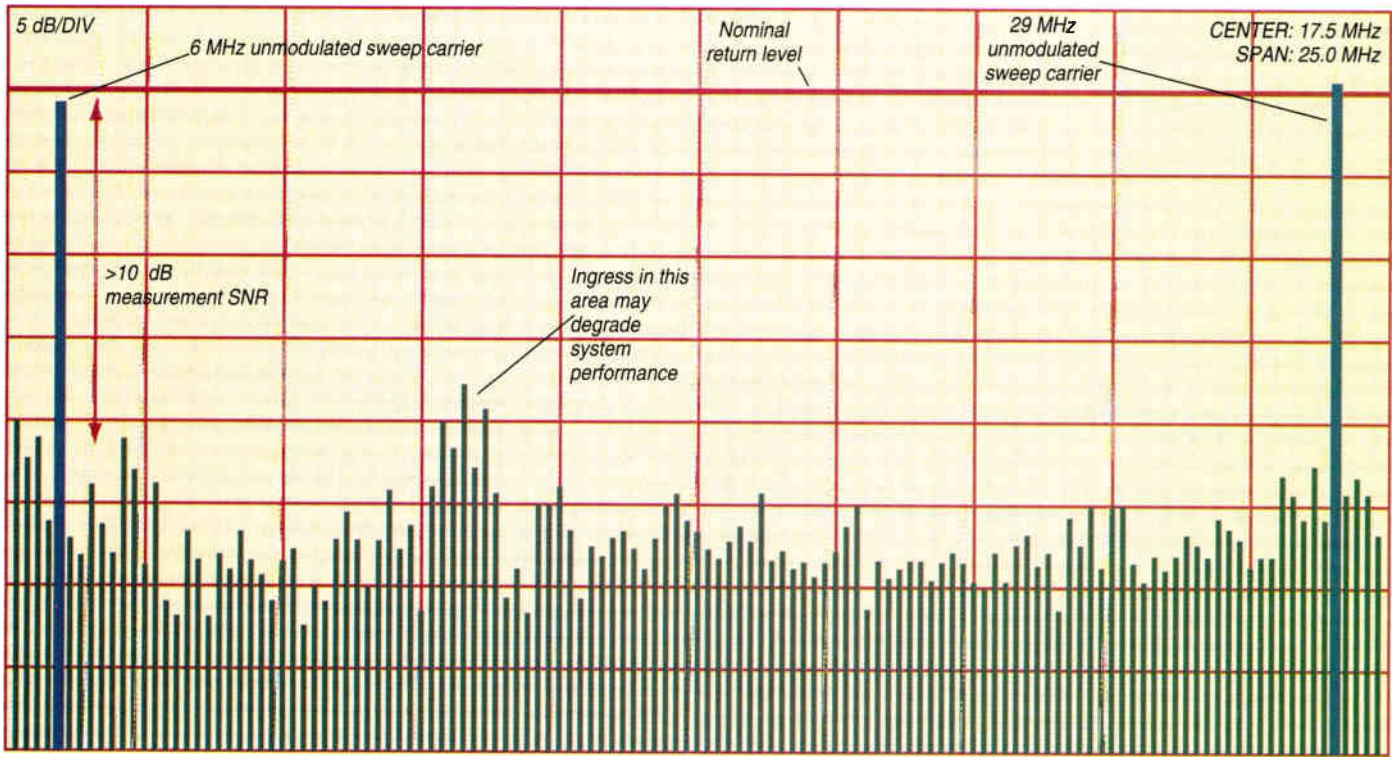
Figure 3a: Normal return spectrum with sweep carriers



is receiving the proper upstream signal levels.

How the field unit provides results to the operator depends on its design. The field unit can display sweep data as a flatness graph compared to a reference, or as calculated values for gain and tilt. Other sweep systems display test results in other ways.

The gain setting of the return modules when they are installed determines how easy it will be to sweep the return path for the first time. If the gain was set too high, the resulting noise may be great enough to swamp the sweep test signals. To avoid this, when installing return amplifier modules, set their gain to minimum or remove the inline pads. If the modules have already been installed with the gain set too high, the operator can improve the sweep-to-noise ratio by temporarily raising the field sweep and headend receive levels, or by connecting only one or two of the fiber receivers to the headend unit at a time, until all paths have been balanced. Once the system has been initially balanced, noise levels will improve, and sweep system levels should be returned to normal to avoid generating intermodulation.

Plugging ingress

The instrument of choice for analyzing ingress problems is a spectrum analyzer. The return maintenance system contains one, but a stand-alone unit can be used for many of the tests. Since return path gain and tilt affect measured ingress levels, definitive ingress measurements should be performed only after the system is balanced. Begin by measuring the ingress level at the test point on the input to each modem (see the note above concerning test points). If ingress levels at any modem are high, measure the ingress at the test points for each of the receivers connected to it. Once the receiver with the noisy output is identified, proceed to the node that drives it.

Field troubleshooting procedures from the node out depend on the test equipment used. The general method is to isolate the return branch causing the ingress problem, then search for the loose hardware where the ingress is entering the system. The trouble spot can be isolated by briefly pulling return modules or pads from amp housings and seeing if the ingress–as measured at the headend–has decreased. The maintenance system has an RF switcher which allows each node to be analyzed individually, and automatically provides the appropriate data to the field units currently working on that node. Essentially, the operator sees the same ingress spectrum the headend unit "sees" and so can observe his own progress. Alternatively, a technician in the headend could observe the display of a conventional spectrum analyzer and report any improvements by radio.

Once the return path is up and running, it is necessary to monitor it more or less continually. The return path contains thousands of connectors and enclosures, a few of which are always coming loose. Fortunately, they usually

DISTORTION MEASUREMENTS?

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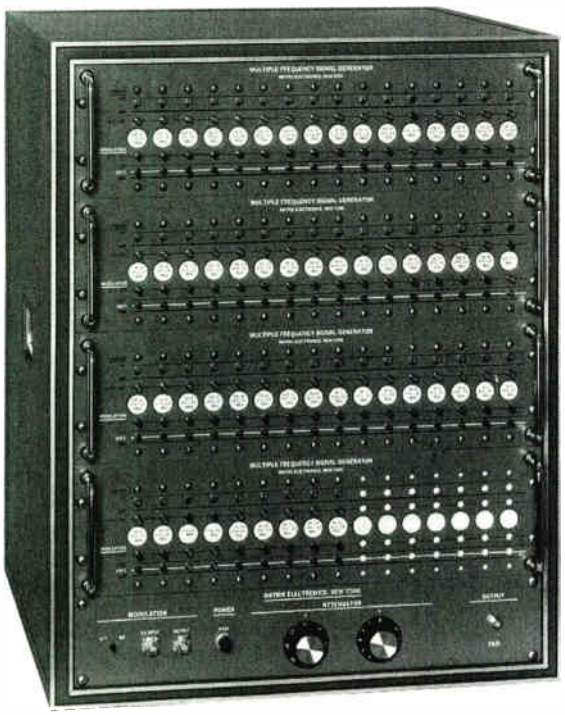

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Combating cable signal theft

Billions in revenue at stake

By Rhea Kaston, general counsel; Henry Schwab, vice president of plant operations and engineering; and Stephen Pagano, president and general manager, TWC Cable Partners, d/b/a Staten Island Cable

Editor's note: *For several years now,* CED *magazine has published the winning papers from the NCTA's signal security ideas competition. What follows is an edited version of the winning 1995 paper.*

Staten Island Cable (SIC) is a franchised cable television operator serving the borough of Staten Island, N.Y. The borough has a population of approximately 400,000, and the system has approximately 90,000 subscribers. In 1992, Time Warner Cable purchased a 50 percent interest in SIC, and the system is now owned jointly by Time Warner Cable and Cox Communications, through its partnership, the TWC Cable Partners. Time Warner Cable is the managing partner and oversees the daily operation of the system.

Prior to Time Warner Cable's acquisition of its interest, the system had been for sale for approximately two years. During this period of time, little was done to address theft, as the focus was on maintaining the status quo while the system was for sale. At this time, it was estimated that as many as 20 percent of the system's subscribers were using pirated convertors to access premium and PPV signals for which they were not paying.

In mid-1993, SIC began to organize its resources to attack the theft problem. It was believed that a large portion of the problem was attributable to a widespread belief in the community that cable theft is not a crime, is a victimless crime, or that the likelihood of being caught was so remote that stealing was worth the risk. Therefore, it was determined to be crucially important to educate the community that cable theft is no different than shoplifting, and that SIC would no longer tolerate theft of service.

Customer information and outreach

The marketing campaign officially began on June 20, 1994, with the announcement to all employees and the press that the cable system had commenced eight federal lawsuits against 45 defendants and were seeking out-of-court settlements from more than 73 others. At the same time, SIC also publicized the penalties for conviction of cable signal theft and announced the implementation of a "Cable Theft Hotline." In a press release and employee presentations, it was stressed that stealing cable is no different than shoplifting.

The hotline offered local residents with a telephone number to call and anonymously forward any information they might have regarding theft of cable television service or tampered equipment. NY 1 News, Time Warner Cable's 24-hour, New York City, all-news channel, covered the story and aired the segment repeatedly during the next week. SIC employees were made aware of the initiative and hotline number in a memorandum from the division president. A series of employee meetings were held shortly thereafter in order to further educate everyone about signal security issues.

In July, the system began airing three licensed anti-theft promotional spots tagged with SIC specific animation and the hotline number. The system also created its own announcement, utilizing the highly recognizable host of the weekly news magazine shown on its local origination channel. In this spot, all viewers are reminded that cable theft is a crime, and that thieves will be caught and legal action taken. This announcement also included the hotline number. Periodically, the system "force tuned" convertor boxes to this announcement. Presently, the system runs approximately 500 anti-theft spots per month, spread across the 13 channels on which commercials are locally inserted.

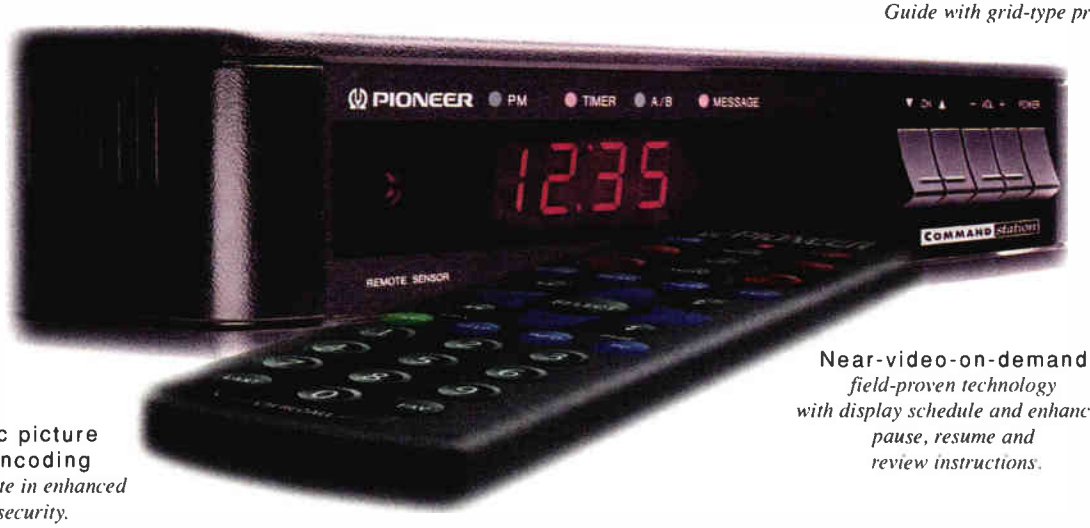
Since its inception, numerous promotional and awareness components were added to the on-going campaign. On a monthly basis, three to four anti-theft print ads promoting the hotline number are placed in the local newspaper and in the Staten Island Cable-specific edition of *TV Guide*. The local newspaper, *The Staten Island Advance*, reaches more than 80 percent of the homes in the borough. SIC has contracted with a local outdoor billboard advertiser to place four billboards per month. These ads also promote the hotline number and are rotated on a monthly basis among more than 300 locations in order to maximize visibility.

About the only thing it doesn't deliver is pizza.

Encrypted data communications
from addressable controller to subscriber.

Extensive on-screen display
with display and graphics capability.

Multiple program guides
Interactive Electronic Program Guide with grid-type presentation.



Near-video-on-demand
field-proven technology with display schedule and enhanced pause, resume and review instructions.

Dynamic picture shift encoding
for the ultimate in enhanced signal security.

Virtual data channels
for additional revenue generation.

As you can see, the BA-V1000 Command Station comes with the works. From its on-screen display capabilities to the security of dynamic picture shift encoding, the Command Station delivers great cable service. It's this kind of vision that keeps your customers happy. And hungry for more. When you're ready to order, just call your Pioneer regional sales manager.

PIONEER®
Pioneer New Media Technologies, Inc.

Northeast, 201-236-4186; Southeast, 614-777-7260; Mid-Atlantic, 614-777-7258; Central, 614-777-7257; West, 310-952-3063.

Additionally, the semi-annual subscriber newsletter promotes use of the hotline. The subscriber handbook and semi-annual subscriber information bill insert have been revised and now contain strongly worded statements regarding cable signal theft penalties and the hotline number.

Response to the hotline has been excellent. It is set up as a voice mailbox so that the caller can leave the information without having to leave a name or number. SIC retrieves the messages and adds the information to its database of suspected illegals. This list is then used as the basis of surprise home visits, and to cross reference with other leads that obtained about pirate convertor users.

SIC discovered, through surprise visits, that at least two firehouses on Staten Island had several pirate boxes. As a result of this discovery, word spread quickly throughout the fire department that those with illegal boxes would be caught. The firehouse quickly settled the matter, prior to a lawsuit being commenced, and ongoing inspections have failed to uncover any additional pirate boxes in the local fire houses.

To date, SIC has limited its legal actions to the civil arena. This has been found to be faster than seeking criminal penalties. This decision has also allowed us to retain a measure of control over the course of the litigation, rather than handing over the case and all subsequent control to the police or district attorney. In the future, depending on the nature of the cases that SIC develops, it may choose to involve law enforcement, but this decision will be made on a case by case basis.

Dealers

The scope of cable theft on Staten Island is so large, that SIC thought it important to begin identifying and closing down dealers. By so doing, those who continued to operate were forced to critically evaluate the risks involved and be more cautious. Although forcing some dealers underground made it more difficult to find and prosecute them, it also made it more difficult for subscribers to find them to purchase pirate boxes.

SIC utilized the services of an undercover investigator to identify several local dealers who were modifying equipment to defeat scramblers. The investigator was also able to develop several confidential informants. Initially, civil suits were brought against two dealers. After further investigation, legal action was started against additional local dealers. These offending dealers were valuable sources of information. By allowing a dealer to "work off" some or all of his debt, SIC was able to gather a tremendous amount of valuable information.

SIC also utilized the information seized by the FBI in San Francisco at Global Cable Network (Global) to identify seven individuals on Staten Island who had purchased convertors in quantities clearly intended for resale. Civil suits have been started against each of these individuals as well.

A review of local newspaper classified ads initially revealed three entities offering convertors for sale. SIC used its private detective to make purchases and to determine the identity of the company making the sale. The company now has three suits pending in Florida against these dealers. In addition, SIC is in the midst of gathering the evidence needed to take similar action against other mail order dealers who have targeted Staten Island.

After commencing the three suits in Florida, a new dealer began to advertise. It was determined that this seller was located in New Jersey, not far from the SIC office. By utilizing undercover investigators, several transactions at the dealer's location were videotaped. As SIC was finalizing the investigation and preparing to seek a civil seizure order, this

Facts about cable piracy

Cable television theft is the illegal interception of cable programming services without the express authorization of, or payment to, a cable television system. There are two types of cable theft: passive and active. Passive theft occurs when a consumer receives services due to faulty cable operator procedures. Active theft occurs when someone knowingly and willfully makes an illegal physical connection to the cable system or attaches or tampers with equipment to allow the receipt of unauthorized services. Active theft can occur at both a consumer or commercial level. Commercial theft occurs when individuals or companies develop, tamper with or manufacture devices which decode unauthorized cable services and receive compensation for that equipment. The devices used to receive the unauthorized services are descramblers, decoders or black boxes.

✔ Based on NCTA's cable piracy survey conducted in 1992, the industry loses an estimated $4.7 billion in unrealized revenue annually.

✔ It is illegal to own or be in possession of an unauthorized cable descrambler in 31 states.

✔ The FCC released a Public Notice in November, 1994 stating that the use of cable descramblers not authorized by cable systems is a violation of federal law.

✔ Piracy affects the picture quality of the system.

✔ Most of the equipment used by cable pirates is not built to system specifications; thus, radio signals used to transmit cable television can leak into frequencies reserved for aeronautical and emergency communications.

✔ It is estimated that each illegal decoder sold to a consumer costs the cable industry approximately $3,108 in lost revenue over its useful life expectancy.

✔ Over the last six years, NCTA's Office of Cable Signal Theft (OCST)has been involved in cases resulting in the seizure of more than 500,000 devices, and the cessation of sales totaling in excess of 1.5 million units. When incorporated into OCST's Economic Impact Formula, these figures represent a savings of almost $900 million to the cable industry.

✔ The $4.7 billion loss does not incorporate unauthorized reception of pay-per-view programming. Engineering analysis of pirate product seized by law enforcement agencies in 1992 (more than 250,000 devices) substantiates that 75 percent of the units were capable of circumventing addressable technology and allowing the illegal reception of pay-per-view services.

✔ Sentences in federal and state theft of service cases have ranged from probation to 16 years in prison. Fines and restitution have ranged from several hundred dollars to $2.7 million. Civil judgments have run as high as $3.9 million.

✔OCST works closely with the Department of Justice, the FBI, U.S. Customs, U.S. Attorneys, state and local prosecutors and law enforcement agencies to investigate and assist in prosecuting criminal violations.

✔ In 1993, more than 1,600 theft of service cases were prosecuted nationwide on federal, state and local levels, up more than 25 percent from 1,300 in 1992.

location was shut down by law enforcement executing search warrants and seizing items found.

When discussing settlements in these actions against dealers, one of the prime concerns has been to get the business records, in addition to a cash payment and a permanent injunction. The business records allow SIC to file suits against the end users who have purchased descramblers for use on the system.

Subscribers

In order to demonstrate that every thief faces the potential of being caught, SIC has taken a variety of steps to compile information internally that can be used to identify households that may be using modified convertors. Civil lawsuits were started against a number of subscribers on whom SIC has direct evidence of their use of a pirate box.

A lot of information was gathered from hotline tips. Each tip is logged, and if enough information has been provided, the account history is checked. Invariably, the account has a primary outlet and a PPV history that stopped abruptly. After sifting through the tips and checking the accounts, unannounced visits to selected homes were made. If SIC was not permitted to check all equipment and wiring, it required the subscriber to schedule a service appointment within 48 hours. Any customer who did not cooperate had their service disconnected, pending the required inspection.

SIC also set up a "sting" during several pay-per-view boxing events to identify some of the households that were viewing the event, but had not ordered it. Each home was then targeted for a surprise visit. Those who would not allow entry were either trapped or disconnected. The company also used this list to cross reference against the list that was compiled through the tips to the hotline.

To assist in gathering evidence against those using pirate boxes, a group of electronic counter measures (ECMs) were developed to "kill" some portion of the illegal boxes being used. The first step was to acquire as many different pirate boxes as possible to test the effectiveness of the countermeasures. Through extensive examination of seized pirated boxes, and with the assistance of one of our informants, SIC and Scientific-Atlanta were able to reverse engineer a number of the defeats and utilize this information to create several ECMs.

Each of the ECMs resulted in a distinctive problem in the box that had been hit. Immediately after launching the first round of these counter measures, SIC received several hundred phone calls for service. Each call that indicated there was a convertor problem that SIC had engineered was tracked separately from the regular service calls. However, within the next 12 to 24 hours, many customers called back to cancel the service call, claiming the problem had been resolved. Staten Island Cable believes that the original calls had been made by family members who did not realize that the boxes were illegal, and the calls were canceled when the key family member learned the appointment had been made. SIC has maintained a list of these accounts, and each will be trapped to prevent reception of premiums or PPV.

Approximately 80 customers did not cancel their service calls. In each of these cases, SIC retrieved the convertor, examined it for tampering and subsequently brought suit against 38 subscribers who returned convertors that had been modified to defeat the system's scrambling. Twelve of these defendants defaulted, and SIC is awaiting damage awards against them. Nineteen have settled. The remainder are in discovery.

In determining the settlement amount, each was offered a lower amount if he or she would provide information about where the box was purchased or who had done the modification. In addition to these 38 defendants, SIC commenced separate actions against a group of sub-

Theft of service survey results

The National Cable Television Association's Office of Cable Signal Theft has reported the results from the 1992 survey of revenue lost to cable television operators due to cable signal theft. The survey was distributed in January 1992 to 2,685 systems. A total of 771 systems reported statistical data (29 percent response rate) based on 1991 year-end data.

The systems responding represent 27 million homes passed, and 16 million subscribers. For analytical purposes, systems were categorized into four groups: under 10,000 subscribers; 10,000-19,999; 20,000-49,999; and 50,000 or more subscribers.[1]

Based on the data provided, the percentage of theft of basic service ranged from 5.81 percent to 14.61 percent illegal basic service, and the percentage of theft of premium service ranged from 6.33 percent to 14.76 percent. Projecting the larger percentages into the cable universe as a whole in each system-size category produces estimates of more than 9.4 million illegal basic and 6.4 million illegal premium users.

Using conservative monthly average rates ($17.95 basic and $10.28 premium), the piracy loss translates into more than $4.7 billion in unrealized revenue annually, or almost 24 percent of gross industry revenue in 1991.

Overall, average percentages of theft are 11.21 percent of basic service, and 11.52 percent of premium service. This is the first time that estimated premium theft percentages have been greater than basic theft percentages.

Table 1: *Cable industry lost revenue due to cable signal theft–1992*

System size	Basic	Premium	Total
50,000 or more			
Potential for theft (households)[2]	30,531,809	19,065,843	—
Theft percentage[3]	14.07%	13.21%	—
Estimated thefts (households)	4,295,826	2,518,598	6,814,424
20,000-49,999			
Potential for theft (households)	20,221,763	13,665,868	—
Theft percentage	14.61%	14.33%	—
Estimated thefts (households)	2,954,400	1,958,319	4,912,719
10,000-19,999			
Potential for theft (households)	10,957,836	7,858,176	—
Theft percentage	10.37%	14.76%	—
Estimated thefts (households)	1,136,328	1,159,867	2,296,195
9,999 or less			
Potential for theft (households)	18,044,331	12,848,893	—
Theft percentage	5.81%	6.33%	—
Estimated thefts (households)	1,048,376	813,335	1,861,711
Total estimated thefts	9,434,930	6,450,119	15,885,049
Rates[4]	$17.95	$10.28	—
Average number of pay services[5]	—	3.4	—
Lost revenue per month	$169,356,994	$225,444,559	$394,801,553
Lost revenue per year	**$2,032,283,928**	**$2,705,334,708**	**$4,737,618,63(**

1 It should be noted that responses to the theft of service survey from large systems (50,000 or more subscribers) represented a larger portion of total responses than large systems represent in the total industry. However, the potential over representation by large systems in the survey results was mitigated by grouping the results into four categories according to system size. The number of households where theft could potentially occur is a conservative figure; in the Nielsen database, not all headends report the number of homes passed.

2 A. C. Nielsen Co., (Cable On-line Data Exchange) Database. Data as of October 31, 1992.

3 Derived from NCTA Office of Cable Signal Theft 1992 Theft of Service Survey.

4 Paul Kagan Associates Inc., Cable TV Financial Databook, June 1992. Data as of December 31, 1991.

5 Derived from Paul Kagan Associates Inc., Census of Cable and Pay TV. Data as of December 31, 1990.

scribers who had returned convertors (prior to our use of the ECM), that showed evidence of tampering. Interestingly, subsequent uses of the ECMs have not resulted in any increase in the service call numbers.

This suggests that the public is more aware that their conduct is illegal, and that there are consequences. SIC believes that these customers have either resumed use of their previously issued legal box, or have returned to the seller to have the blown out box repaired.

SIC also targeted subscribers who had purchased convertors from Global. After cross referencing the Global list with its database, the operator sent out demand letters to more than 100 subscribers who had purchased one or more convertors from Global. Of these, 35 settled. Thereafter, SIC filed suit against the 73 Global customers who had ignored the pre-suit letter. To date, 39 of these defendants have settled, four are in default, nine suits were discontinued, and the remainder are in discovery.

Based on the settlement history in the suits that have been brought to date, SIC has recently decided to increase its settlement demands. Initially, in end-user suits, the company was seeking $2,000 to settle and would reduce this to $1,000 if the user would provide information about the seller. A large percentage of the defendants readily paid the $2,000 to keep quiet and have the suit dismissed. As a result, in the suits brought more recently, SIC has decided to increase its settlement demands to see whether a higher demand would be as readily received.

Internal security measures

As its efforts to attack theft increased, the operator also took a critical look at the processes and procedures internally to be sure that internal control measures were effective. Specifically, SIC tightened the procedures involved in the issue and check-in of convertors to installers and service techs. The operator also made sure that all employees knew that the company was taking theft seriously. SIC now conducts frequent surveys of our employee courtesy accounts to insure that terminated employees are promptly converted to regular accounts, and that accounts are not being "given" to family members when an employee moves from the franchise.

Other measures Staten Island Cable would like to take involve some programming changes by its billing system vendor, so far without success. Specifically, there are fields of information that should not be accessible to anyone in customer service, order entry, dispatch, etc. There simply is no reason for the convertor's electronic I.D. number to be readi-

ly available to everyone with access to the billing system. This number can easily be used to clone a limitless number of boxes by anyone with a microprocessor programming unit.

Results

As word spread throughout Staten Island that SIC would no longer tolerate cable theft, there was at least one unanticipated outcome. Specifically, subscribers had learned that they could avoid being held responsible for a tampered box by claiming it had been stolen. In the past, it had been policy to waive the unreturned convertor fee if the subscriber submitted a police report documenting the theft and an affidavit that the loss was not covered by insurance. In 1994, as SIC stepped up its education and enforcement efforts, it received reports of 1,500 convertors being stolen.

With a subscriber base of approximately 90,000, this means that nearly two percent of the customers reported a stolen box in 1994. This was an increase of approximately 1,000 percent over the number of boxes reported stolen in 1993. Moreover, an examination of the police reports submitted revealed not only that certain subscribers claimed to have had multiple boxes stolen throughout the year, but that in most of the cases, the only item reported stolen was the convertor.

It is the policy of the police force to take any complaint made and complete a report, but these reports are rarely investigated. Therefore SIC doubts the truth of many of these reports. It appears that customers who do not want to be held accountable for a convertor that has been modified are willing to swear out a false police report in order to have the convertor removed from the account on the database.

As a result, SIC has now instituted a policy requiring payment for all lost, stolen or damaged boxes, regardless of the circumstances. For the first quarter of 1995, the number of reported stolen boxes is down to 90, a 75 percent drop off last year's pace. Although several customers have complained to the franchising authority in the City of New York and to the New York State Cable Commission, thus far, each entity has supported SIC.

Dealers in Staten Island have now become much more cautious. This is confirmed by information available through confidential informants and private investigators. Small scale dealers who operate from homes or vans no longer will sell to just anyone who shows up. Rather, they are taking more elaborate steps to insure that they know who they are selling to.

Finally, based on information obtained by speaking to SIC employees and others from the community, the average subscriber is much more aware of the potential risks associated with stealing cable. The cases that the operator has pending represent only a small percentage of the subscribers who may have been stealing. Nevertheless, word of these suits has spread widely. Those who have been sued are forced to make significant settlement payments or shoulder the cost of litigation. Moreover, many have voiced concern over the publicity and the impact that it could have on their employment.

To date, SIC has received settlements totalling more than $100,000. In addition, there are still a significant number of suits pending, and SIC anticipates additional settlements and judgments.

Like any effort undertaken at the system level, the best results are achieved when all the resources of the system are brought to bear on the problem. SIC has utilized this philosophy in attacking the problem of cable theft. SIC has fully integrated its efforts by getting each department involved. They have each made an important contribution, utilizing their special skills and assets. Marketing efforts range from educating consumers about the criminal and civil penalties involved with cable theft to assisting in setting traps for thieves through the use of special offers.

Customer Service has assisted in keeping management informed of any suspicious activities and service calls they detected. Installation and Service was instrumental in identifying suspicious accounts and with the collection of illegal convertors after the use of ECMs.

MIS has assisted in numerous ways, but was especially helpful in assisting in confirming suspected illegal accounts whose premium and/or PPV activity ceased. Convertor Control has been instrumental in identifying and analyzing tampered equipment. Engineering has worked continually with Scientific-Atlanta to investigate and develop new defeats for compromised convertors.

Success in the field of signal security depends on constant vigilance and continual efforts by all departments working together. Unfortunately, cable security is a fight that is never finished and never won. A system's success can only be measured by its ongoing efforts to secure equipment and signals, and its persistent prosecution of pirates. CED

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Op support systems hot at Cable-Tec Expo

Vendors offer numerous management tools

By Roger Brown, Dana Cervenka and Leslie Ellis

More than 6,800 members of the cable industry's technical community gathered in Las Vegas last month, but they weren't there to gamble. Instead, they came searching for a variety of new products and knowledge on how to improve the technical operations of their plants. In both cases, they came away a lot richer.

If an ill-timed catastrophic outage affecting a fiber node and 1,000 customers simultaneously is every engineer's nightmare, then the messages delivered during the annual Engineering Conference and Cable-Tec Expo, hosted by the newly-named Society of Telecommunications Engineers, should come as restful news.

In sessions and on the Expo floor, discussions of obsolete and rarely implemented status monitoring systems were given new life, albeit under a new moniker: operational support systems (OSS).

During the engineering conference, for example, MSO executives cautioned against waiting too long before starting to think about OSS. "We'd better start implementing some OSS projects, even on a limited basis, really soon," urged John Anderson, chief scientist of project engineering for Rogers Cablesystems, who added that, "OSS cannot be an afterthought—it's too late to think about OSS after a service has been deployed."

CableLabs certainly agrees. The R&D arm of the industry followed up the Expo by hosting a meeting for MSO information system executives in Denver in late June to garner consensus on how to best plan for and implement OSS. Several CableLabs personnel were on hand in Las Vegas, searching for the latest and greatest in network management and OSS software and hardware.

For those unfamiliar with the concept, an OSS is a software system that both enables and enhances the business process, and spans the gamut from marketing/sales to engineering and operations. It's a combination of intelligent hardware and software that together, can remotely monitor system performance, track problems, provision service and a host of other functions designed to improve plant operations. "The bottom line of OSS is a competitive edge in delivering new services, like telephony and high-speed data," Anderson said.

Meanwhile, several vendors came to Expo to unveil new and improved OSS wares. AM Communications, for example, announced new deals with both Hewlett-Packard Corp.'s microwave instruments division and ADC Telecommunications to co-develop operational support systems.

The deals are significant for AM. The HP agreement, for example, has been in the works for about 18 months, according to David DeLane, vice president of marketing and sales for the company. "We're hearing from customers that they want a complete operational support system, and this agreement blends the software and hardware components they need to do that," said DeLane.

In the HP deal, AM will lend unspecified parts of its new "OmniVu" system, which debuted at Expo. OmniVu, said Joe Rocci, vice president of Product Technology for AM, is a complete departure from the company's existing status monitoring gear, and includes modules that fit into plant actives, as well as a modular software front-end.

"We've been developing [OmniVu] for almost two years, with a design focus on using common protocols," Rocci said, adding that the system's software front-end is configured "like a Lego set—where customers can build up with pieces as they see fit."

Under the terms of the agreement with ADC Telecommunications, AM will be charged with developing and manufacturing a set of application-specific coaxial element monitors to be compatible with ADC's network management system. The technology, to be used within the framework of ADC's Homeworx HFC access platform, will be deployed in the networks of RBOCs, as well as MSOs, according to DeLane.

Also showing off new OSS products last month: General Instrument, which also has a deal with AM; Scientific-Atlanta Inc.; Antec, through its agreement with Superior Electronics; and Barco, a Belgium-based entrant better known for its large-screen display systems.

Barco's new products include "Rosa," a Windows-based, graphical software tool designed to let operators "see" the complete cable network on one screen, and generate alarms when network problems occur, said George Walter, product group manager for Barco. The software includes interfaces to most leading database packages, he said, and alarms can be routed to computers at remote locations, for immediate, local dispatch.

Also new from Barco is its LM 860 Network Supervisor, a headend-based device that measures up to 200 television, radio or other carrier signals within a cable network. The LM 860 interfaces to Barco's Rosa software, so that operators can monitor RF levels, signal-to-noise ratio, hum modulation, and analog/digital inputs and outputs, said Walter.

Antec Corp.'s wares include a "first phase" status monitoring system that uses a PC loaded with software to monitor and test both headend and distribution equipment. It includes a headend controller to manage the communication between the software and various network elements.

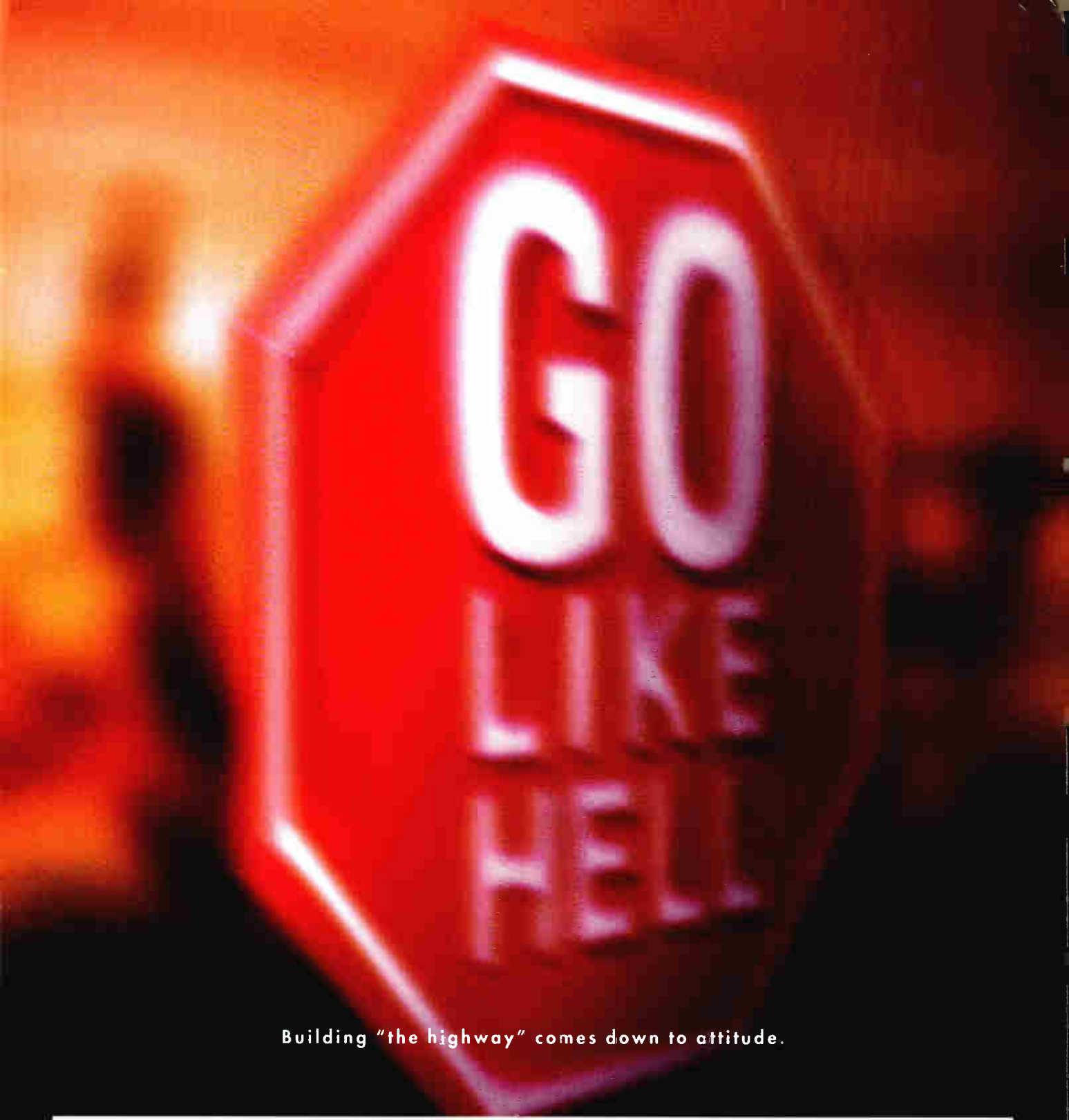
Superior Electronics demonstrated its network management system at Expo. The Cheetah Network Management System (CNMS) allows operators to provision new equipment and network services, isolate faults and monitor performance. Through an expert system, it provides advanced alarm management capabilities.

S-A's OSS approach was designed to manage the entire analog and digital network, with components that include session, element and system managers, company executives said in a statement. Those managers establish interactive sessions between home terminals and servers, and control access, manage bandwidth, monitor performance and interface with billing systems.

Distribution equipment

In addition to its status monitoring equipment, Antec made a series of product introductions for the distribution portion of the plant at Expo, including the debut of the Regal 1 GHz PowerTap II, which gives operators the ability to install a 1 GHz video tap and change out the faceplate to provide for network-powered telephone services, once telephony is introduced to the network.

Antec also announced its new 750 MHz



Building "the highway" comes down to attitude.

The speed of change has no posted limits. Whoever arrives first with the most is the winner. Check your rearview and note that hindsight is 20/20. We pave the road from highway to driveway. Accelerate today into integrated video, voice & data. Step on it and wave bye.

1.800.TO.ANTEC

ANTEC

network know-how

NOW.

Regal tap and line passive products for systems seeking to increase bandwidth capacity of their broadband infrastructures.

Viewsonics Inc. launched several new products, including: line extender style, two-way amplifiers with 35 dB gain, 54-860 MHz forward bandwidth and 5-40 MHz return, 3.5 dB noise figure; 15 dB gain, 3.5 dB noise figure mini amps; multi-output, 15 dB gain, 2-way amps with a 3.5 dB noise figure; and comb generators at 5-42 MHz.

The new 7000 Series MDU amplifier from Lindsay is specifically developed to handle a potentially hostile environment. Utilization of the Lindsay-patented Dynofin housing and high tolerance NC milling process produces cool running operation, and greatly improved EMI isolation in a tamper-proof MDU amplifier. The company also displayed the LGA Amplifier, the latest member of the Digital Ready Symmetrical 100 Series Communications Products. With diplex or triplex filtering, ALC Control, 1 GHz operation, 5-42 MHz reverse, and soft start inrush current protection, the amp allows for modern two-way architectures at a high level of performance and less maintenance.

Finally, Lindsay introduced the LSA15 subscriber amplifier, the latest member of the New Era Communication Products.

ARNCO Corp. introduced Perma-Guard WR Drop Plus Duct, a hybrid drop plus duct combination used to install telephone or CATV, while providing quick access for future line installations. Applications include new construction projects, where expansion or additional utilities are anticipated, as well as replacement or renovation.

The company also featured its AIR-TRAK system, which uses a double action push/pull operation to maneuver fiber optics through complex installations. The system uses a small 175-250 CFM compressor as its air source, in addition to a hydraulic powered tractor belt drive, and can be adapted to different duct applications with optional accessories.

Telecrafter Products introduced a drop enclosure that eliminates sharp cable turning radii that impede signal transmission. The enclosure is smaller than conventional residential drop enclosures, but its design facilitates more components, in better configurations, to preserve signal quality.

To further facilitate proper cable installation, Telecrafter debuted the RB-4 Clip Gun System, which helps ensure damage-free installations and signal integrity when used to fasten dual and messengered cable to any wooden surface. The clips are manufactured of high density polyethylene that cradles and protects sensitive dual cable.

ARNCO's AIR-TRAK system

Holland Electronics displayed its new line of 1 GHz passives, including splitters, hardline taps and directional couplers. Proper passive testing was also demonstrated by technical personnel in the company's booth.

Belden Wire & Cable featured a full line of Series 59, 6, 7 and 11 coaxial drop cables with several different shield designs, and in aerial, buried and indoor versions. Also available: fiber optic trunk cables in all-dielectric, armored and messengered configurations with four to 240 singlemode fibers in loose, gel-filled color-coded buffer tubes, and composite cables (coaxial cable and twisted pair).

Trilogy Communications announced at Expo the development of an NEC Riser-rated version of its high performance MC2 product. The CATVR listed cable is available in 1/2, 3/4 and one-inch sizes and in 75 or 80 ohm impedance. The Riser product line is for use in buildings for transporting video, voice and data on and between floors.

A new line of off-premise interdiction products was demonstrated by Blonder Tongue Laboratories. The VideoMask addressable system includes a four-port field unit that accommodates up to 16 oscillators for longer dwell times and better signal jamming of up to 72 channels simultaneously. Jamming capability is provided over the 48 MHz to 600 MHz bandwidth, and the passband extends to 750 MHz.

With the modular unit, the number of jamming modules can be selected based on system requirements. Each unit begins with a housing, motherboard and power supply to which several modules can be attached, including: RF distribution, control and up to four jamming modules. Directional couplers, equalizers and attenuators can also be added.

Quality RF Services announced that it is providing bandwidths above 450 MHz for Jerrold SJ and Starline 20 systems.

The QSJ family of modules and chassis breaks the 450 MHz frequency limits of standard SJ modules. The new chassis and modules replace the SCD-2W and all previous versions of Jerrold modules.

Budco displayed an assortment of installation and construction tools from more than 30 CATV product manufacturers, as well as a selection of Lemco tools at Expo. Lemco's products include those for reel handling, aerial construction, splicing and underground construction and installation.

Fiber optics

Manufacturers trotted out new fiber optic products aimed at operators who are looking to enhance the reliability of their systems, and better manage their fiber infrastructures. In one example of that, Photon Systems Corp. introduced the Series 5000, a high density modular platform for broadband fiber optic transmission. The 5000 mainframe accommodates DFB laser transmitters, single and dual density optical receivers, and redundant powering and status monitoring modules. Up to nine modules function interchangeably in the three rack-unit mainframe.

An open architecture backplane provides direct monitoring and control to any module in an attached mainframe. Connection via PC communication software or advanced status monitoring systems is possible. Passive thermal management ensures high reliability and minimal power consumption.

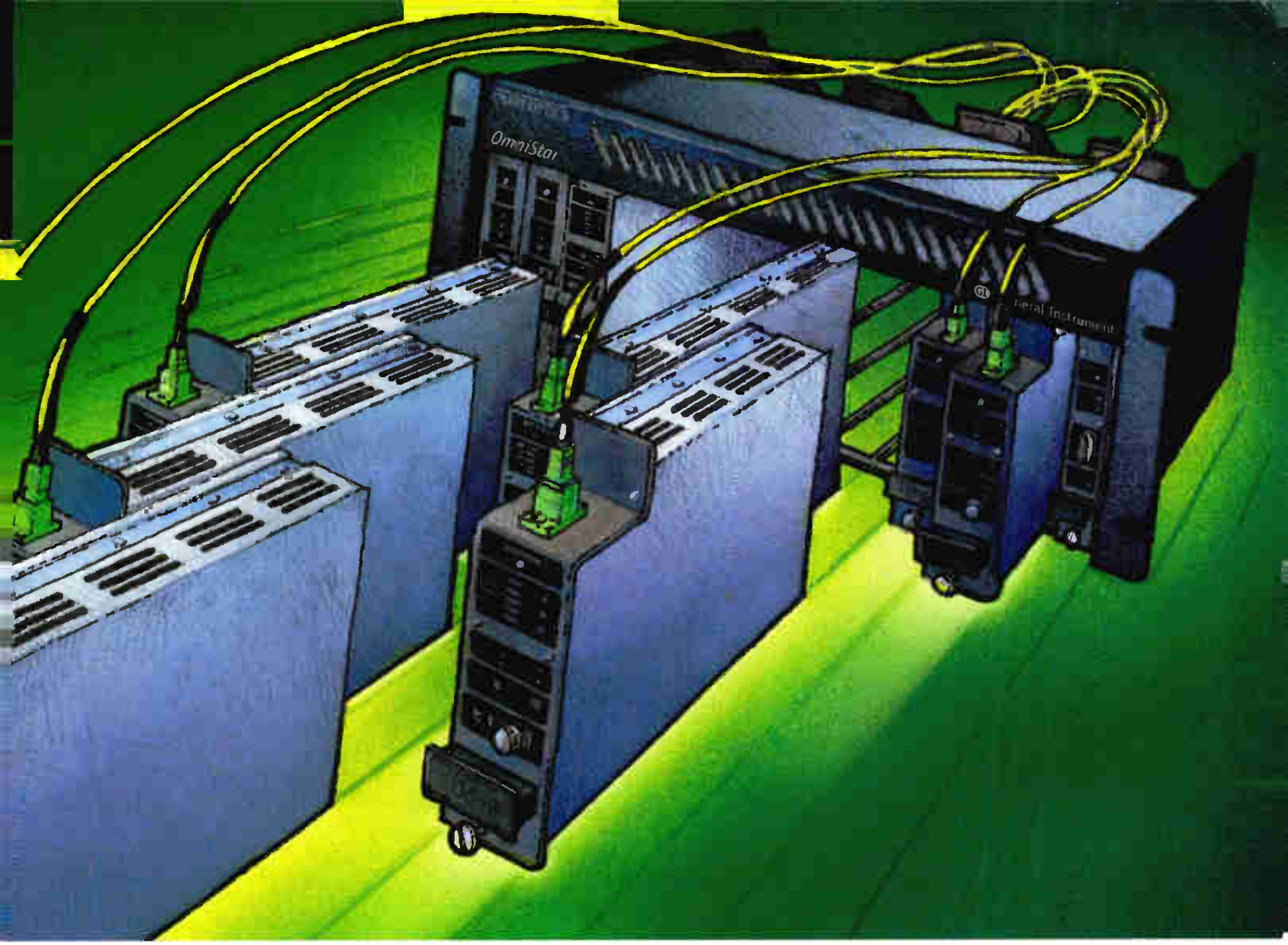
Aria Technologies Inc. introduced a new method of attaching ONUs (Optical Network Units) to CATV optical outside plant cable. The AMCA cable assembly provides a simple and practical method of attaching an ONU to a CATV fiber distribution system.

The assembly can be specifically designed for use in any CATV architecture, and by utilizing the AMCA Cable assembly in a CATV system, both system downtime and field installation time can be reduced.

Each assembly is capable of supporting the furcation of from two to 12 optical fibers. Each 250 micron fiber is individually protected within a semi-rigid Teflon Tube which is structurally integrated to the inside of the ONU's Cable feedthru adapter.

In the realm of everything you ever wanted to know about fiber, but were afraid to ask, Corning announced that its Optical Fiber Information Center is now available on the Internet's World Wide Web. The new Web site features optical fiber and components literature, technical and application support, real-life examples and case histories, guidelines for fiber selection, training materials and product brochures. The center is located at http://usa.net/corning-fiber/.

Optical Modulation Inc., a member company of the Synchronous Group, announced at



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Circle Reader Service No. 38

Vartanian named new SCTE chairman, luminaries honored

Outgoing SCTE board Chairman Tom Elliot of Tele-Communications Inc. handed the gavel over to industry veteran John Vartanian, vice president of technology and operations at Viewer's Choice, during the awards luncheon ceremony, held in conjunction with the annual engineering conference last month.

ALL PHOTOGRAPHY BY CLINT KARLSEN

Outgoing SCTE Chairman Tom Elliot of TCI (left) hands the gavel over to the new Chairman, John Vartanian of Viewer's Choice.

Vartanian will now lead the Society, which has more than 14,000 members, for at least the next 12 months. The new chairman indicated his role will be to spur additional growth by raising consciousness among non-engineering personnel about the value of the organization. "We're doing an exceptional job of training, but we need to get the word out about it," he said during an interview. He also said the SCTE intends to focus its efforts on digital video compression training through new seminars and its BCT/E certification program.

Vartanian takes the SCTE reins during a time of astounding growth. In addition to reaching the 14,000-member milestone, Society President Bill Riker announced that the SCTE has purchased eight acres of land and plans to construct a new, larger, headquarters facility that could be occupied as early as the end of this year.

Vartanian is a veteran of the industry and an active member of the SCTE for many years. He became familiar to most in the technical community during his tenure at HBO, where he served as director of engineering for several years.

Vartanian was involved with HBO's 1985 launch of the nation's first satellite scrambling system, a massive feat of engineering.

He has a reputation among his colleagues as being "cool under fire" and extremely adept at making complex engineering issues seem simple (see CED, *April 1992, page 20).*

Vartanian earned his E.E. degree in 1979, from Renssalear Polytechnic Institute.

Other board officers elected for the next 12 months include: Steve Christopher of CommScope, who represents Alabama, Arkansas, Louisiana, Mississippi and Tennessee, and was elected Eastern Vice Chairman; Tom Elliot of TCI, an at-large member, who leaves his post as chairman but continues to serve as Western Vice Chair; Andy Scott of Columbia Cable, who represents Alaska, Idaho, Montana, Oregon and Washington, and was named Secretary; and Robert Schaeffer of Star Cablevision Group, representing Minnesota, North and South Dakota, and Washington, will serve as Treasurer. In addition, Michael Smith of Adelphia Communications, who represents Kentucky, North Carolina, Virginia, West Virginia and the District of Columbia, was named an additional member of the Executive Committee.

Honoring excellence

Time Warner Cable's Jim Haag was presented with the SCTE's highest indi-

SCTE President Bill Riker (left) and TCI's Elliot present Powell Bedgood (center) with the Chairman's Award. Bedgood accepted the award for Crown Cable of Alabama, where he serves as technical director.

Ted Hartson, Post-Newsweek vice president and chief engineer (right), is inducted into the Hall of Fame. Presenting are the SCTE's Riker and Diana Riley, senior account manager, Jerry Conn Associates.

Bela Zador of Jones Intercable (right) receives the Field Operations Award for his "smart ground block."

"You really like me! You really do!," says overall winner Jimmy Smith (right) of Lakewood Cablevision, Onalaska, Texas.

vidual honor, the member of the year award, during the annual awards luncheon. Haag, a 13-year industry veteran who has held engineering positions with Jones and TCI, was honored for his tireless efforts in steering the Society's interface practices subcommittee toward developing connectivity standards and recommended practices.

Crown Cable of Alabama was presented with the Chairman's Award by Tom Elliot. Crown Cable was recognized for supporting the SCTE Installer Certification program by certifying 54 installers, more than any other company. The award was accepted by Powell Bedgood, technical director for the system.

Also at the luncheon ceremony, Post-Newsweek VP and Chief Engineer Ted Hartson was inducted into the SCTE Hall of Fame.

Hartson, affectionately known as "Dr. Strangeleak" for his work on the FCC's cumulative leakage index requirements, said that his years in cable have offered up all sorts of strange circumstances, including having built a microwave dish out of aluminum siding.

Other major award winners included:

Bela Zador of Jones Intercable took top honors in the fourth annual Field Operations Award competition for his "smart ground block" that allows a CSR and consumer to determine if an active signal is entering the customer premise.

David Large, principal with Media Connections Group and engineer formerly associated with Intermedia Partners and Gill Cable, was elevated to Fellow Member status.

The former Gulf Coast and Llano Estacado meeting groups were elevated to full chapter status. The Society now counts 70 chapters and three meeting groups in its fold.

A more lighthearted set of honors were bestowed one evening at Expo. In an annual contest of skill, cunning, and general cable know-how, the SCTE pitted members of the cable technical community against each other during its traditional Cable-Tec Games.

Doug Lanham of Century Communications (second from right) displays his winning concentration in Cable Jeopardy.

Contestants participated in games like "Cable Jeopardy;" "Cable Splicing." "Go Fetch" (participants are timed as they identify various cable components); and "Meter Reading."

While the contestants insisted that it was all in good fun, their intense concentration level, furrowed brows and steely-eyed stares gave away their overwhelming hunger for victory.

First place in the overall standings went to Jimmy Smith of Lakewood Cablevision in Onalaska, Texas; second overall went to Michael Clark of TCI, Ogden; and third place was awarded to Jim Fronk, Multimedia, Great Bend, Kan.

First place in Cable Jeopardy went to Doug Lanham, Century Communications; second to Steve Allen, Jones Intercable, Roseville, Calif.; and third place was awarded to Lee Skinnell, Cox Cable, Lubbock.

Steve Allen of Jones Intercable, Roseville, Calif. manhandles a cable in the splicing contest.

First place in Go Fetch went to Smith; second to David Meszes, Cablevision of Cleveland; and third to Allen.

Bart Hubbard of TCI, Ogden garnered first place in the splicing contest; Clark took second; and Smith, third.

And finally, in the challenging meter reading contest, Smith was awarded another first place; Ricardo Ortiz of TCI, Santa Cruz won second; and Clark was awarded third.

TCI developed the meter reading test for the games, while the splicing contest was conceived of by Gilbert Engineering. Time Warner's Denver Training Center contributed Go Fetch, and NCTI challenged contestants with its version of Cable Jeopardy.

Expo several new external modulation transmitters operating at 1310 nm. The transmitters are designed to meet requirements for dependable fiber operation in CATV systems.

The new transmitters will be available with either a single or dual optical output, with output power of 10 and six milliwatts, respectively. The new line will be available sometime in fourth quarter '95.

Two new high-speed, short wavelength optical modules are now available from Methode Electronics Inc., Optoelectronics Products Division. The MTM-8510 transmitter and the MRM-8510 receiver are simplex optical modules which have been developed in cooperation with Finisar Corp.

Both simplex modules support data rates to 1.5 Gbps over multimode fiber at distances to 500 meters. SC or ST standard connector options are available. The data links were developed to meet standards such as Fibre Channel, serial HIPI (High Performance Parallel Interface) and ATM/Sonet (Asynchronous Transfer Mode/Synchronous Optical Network) for the interconnection of high-speed workstations in commercial and technical applications.

Siecor Corp. introduced the FuseLite Termination System, which fusion splices within the physical boundaries of an optical connector, providing factory-installed connector performance with simplified field installation techniques. The splicer converts quickly and easily to perform fiber-to-fiber splicing.

The cleaved fiber is installed in the FuseLite connector ferrule and polished in the factory, eliminating the need for field polishing, increasing the quality of the termination, and greatly reducing installation time.

The company also displayed its Access Provisioning Facility, and OTDR Plus.

A new singlemode fiber 2x2 switchable optical splitter was shown for the first time by OptiVideo. In the splitter mode, the device splits the input signal in any selectable ratio between 10 percent and 90 percent in either direction. In the switched mode, the unit passes all input light to a single output.

The unit permits optimum configuration in route redundant broadband networks and offers an access port for OTDR testing.

Porta Systems Corp. debuted its new Fiber Frame Administration Software program, designed to automate both the fiber optic jumper cable assignment and record keeping.

The FFAS program allows the user to select a range of housings to create a fiber distribution frame system that may consist of up to 40 frames in a lineup. The user selects a source and destination, and the software determines the optimum jumper length and cable routing, based on available inventory.

Records are automatically generated on patchcord assignments, frame or cable identification connections, patchcord inventory and a database summary of system components.

ABC Cable Products made a number of introductions, including the CBLinX-2, a new baseband optical transmitter and receiver, designed for broadcast quality single-channel video and dual audio environments.

In addition, ABC displayed an Ethernet optical solution for local area networking. When combined with the company's multichannel optical video equipment, school districts, campuses and industrial users can take advantage of fiber for both video and data uses.

Pirelli displayed its CATV 1550 nm Linearized Transmitter, which features reliable 980 nm pump laser technology. The company has also announced a new optical receiver, as well as a line of optical amplifiers.

Foxcom Inc. displayed its System 7000 wideband fiber optic satellite antenna remoting link at Expo. The system transmits an entire 900-1750 MHz L-band polarization over distances ranging from 100 meters to 10 miles.

The ubiquitous Antec debuted a mass fusion fiber optic splicing program, called InterLINK, at Expo. InterLINK, according to the company, cuts the cost of fiber optic splicing in half, while tripling splicing productivity. In other fiber news, the company has added the Laser Link 1550 nm optical transmitter and amplifier, the Gateway Series II Optical Receiver, and a frequency block conversion system to its product lines.

And finally, Antec introduced an advanced Optical Transition Node solution and three new optical enclosures: MAX custom field enclosures, FiberPak PLUS, an enhanced FiberPak splice enclosure, and two new Keptel Aerial Weatherproof Fiber Closures, the LG-500 and LG-600.

Test equipment

MSOs working to shore up the quality and integrity of their systems found a number of new testing options at Expo. For its part, Tektronix Inc. chose the show as its venue to introduce a new, lightweight baseband measurement tool for the worldwide cable television market: the VM100 Measurement Set.

The VM100 is designed to deliver a full set of FCC baseband measurements, plus additional measurements key to keeping a baseband system tuned up. One key feature of the unit is its automatic test signal identification, which automatically identifies and measures the selected test signal, including its field and line position.

Also new from Tektronix is the RFM90 SignalMini Handheld Signal Level Meter, which is tailored to meet the requirements of fundamental cable TV installation applications. The RFM90 includes a 48 MHz to 860 MHz frequency range, and up to 64 user-definable frequency setups.

To help operators handle maintenance of the daunting return path, Trilithic Inc. launched the 9580 SSR/SST return alignment system, which monitors the full performance of the return path, testing ingress and return noise, as well as flatness, updating measurements twice per second.

The SST Headend Unit occupies 3.5 inches of rack space, and supports up to 6 SSR Field Units simultaneously. The SST monitors up to eight individual return test points and sends ingress and flatness data to each SSR for the path it is connected to. Data can also be sent to a remote PC via the phone lines.

Riser-Bond Instruments has introduced two new features for its Model 1205C Time Domain Reflectometer, Cable Fault Locator.

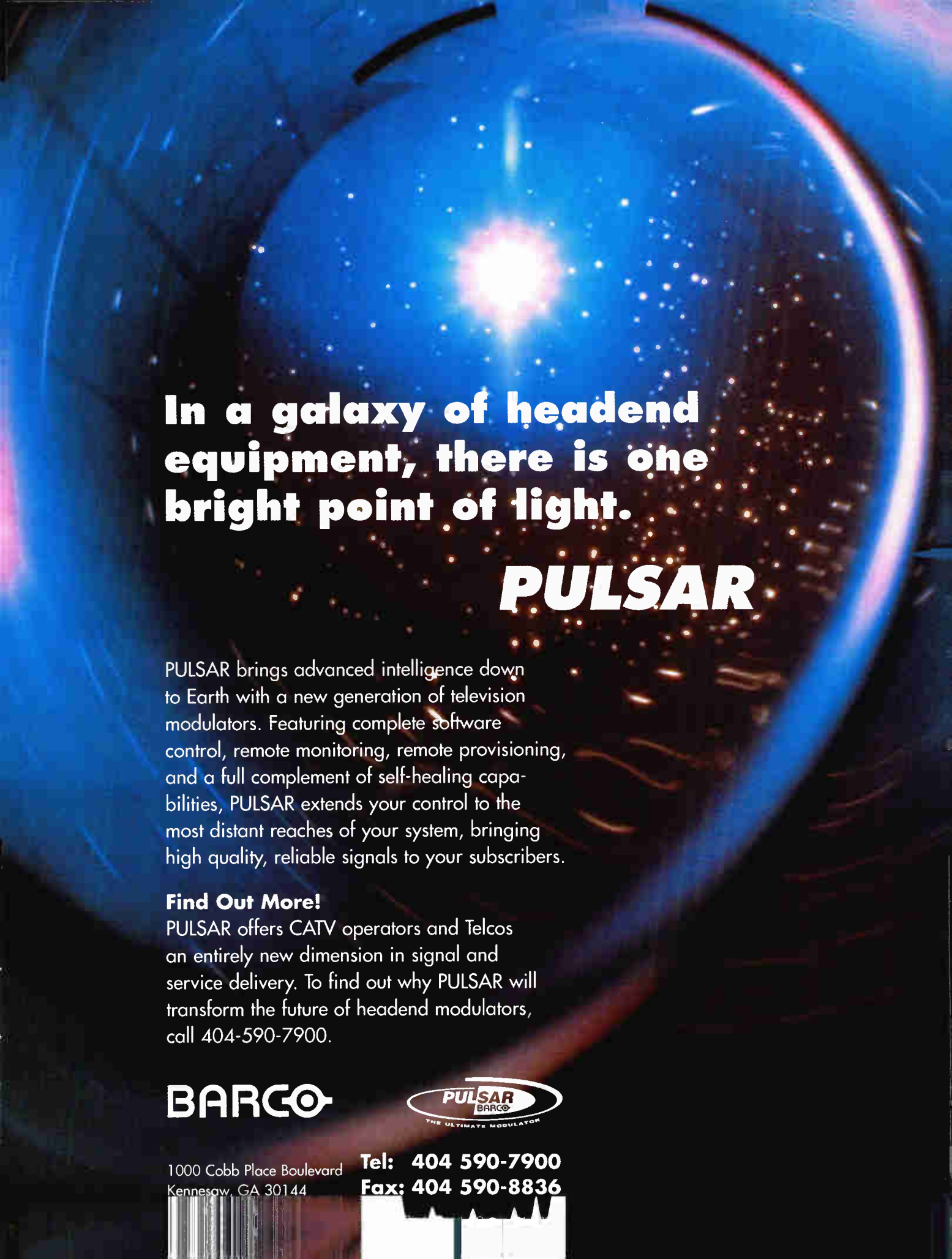
Riser-Bond enhances 1205C TDR

An enhanced Fault dBRL mode and a newly-developed Intermittent Fault Detection Mode (IFD) have both been added to the product. With the Fault dBRL mode activated, the Model 1205C will automatically display a fault severity reading, with the effects of cable attenuation cancelled out of the dBRL reading.

HP CaLan introduced software that automates the cumbersome process of generating proof-of-performance reports for the FCC. With the HP CaLan 85921A FCC report generator software, the portfolio of FCC reports can be printed instantly from data extracted from a single test instrument.

Looking to the next generation of test equipment, which will tackle digital, HP introduced a new option for the HP 89400 vector signal analyzer family which allows the analyzer to characterize digital RF modulation; it verifies that the high-speed data streams containing digital video have been transferred accurately onto the RF carriers that transport them.

CAT V Inc. announced its new VLI receiver system for signal leakage detection at Expo. The unit can detect and fingerprint only those signals which leak from the cable system,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EXFO E.O. Engineering Inc. has added a 10 ns pulse width to its Fiber Tool Box (FTB) mini-OTDR. The new, shorter pulse reduces the singlemode dead zone and makes finding events near the front-end connector and between connectors in the fiber span easier. The FTB now has eight pulse widths to choose from.

CTV Inc. announced the availability of model TBP-4, a tuneable bandpass filter used in carrier-to-noise, composite triple-beat, composite second order and hum measurements.

The TBP-4 has a frequency range of 48 MHz to 750 MHz and an impedance of 75 ohms. With insertion loss values from 0.5 dB through 1.3 dB, and a VSWR of less than 1.5:1, it also offers a 3 dB bandwidth of five percent nominal @ 48 MHz, one percent nominal @ 750 MHz.

The TBP-4 consists of four manually tuneable filters mounted in one field rugged piece of test equipment.

Powering

Vendors debuted powering options to support new services such as telephony, as well as traditional broadband offerings. In the former category, Power Guard introduced its Unity Wave network powering system for broadband network operators planning to deliver telephony services to consumers.

A telephone network has fluctuating power requirements. Traditional 60-volt, 15-amp broadband power supplies generate about 900 watts of power. Most ferroresonant power supplies deployed today are positioned to handle the static powering needs of broadband systems, but are inefficient in accommodating the fluctuating demand required to deliver broadband telephony.

Most of the ferroresonant power supplies in service achieve only 75 percent of optimum powering performance, primarily due to the limitations of AC waveforms that create a pulsing current that loses its intensity the farther it travels from the source.

Unity Wave achieves greater reach and efficiency by more closely resembling the performance of DC powering, the type used in telephone services, according to company officials. It uses switched mode technologies to take AC power, convert it to DC and create a trapezoidal waveform which extends the peaks of traditional AC waveforms and reduces the time between cycles.

This allows Unity Wave to achieve a smooth, controlled and predictable wave shape, like that of DC powering.

Unity Wave is available in capacities ranging from 1,350 up to 6,000 watts at voltage ranges of 60 through 90 volts. These wattages and volts are delivered at a 0.95 power factor at 60 Hz, allowing communications providers to serve 20 to 38 percent more homes from each coaxial feeder cable. Unity Wave extends power reach from five to 18 percent over traditional ferroresonant powering sources. The system can be programmed to operate at lower frequencies for even greater network efficiency, company officials said.

C-COR Electronics Inc. presented a new 90 volt system powering alternative at Expo. The company has developed a variety of 90 volt products, including the 700 series FlexNet Trunks and Bridgers, 700 Series Line Extenders and LinkNet AM Fiber Optic nodes. The systems meet National Electrical Safety Committee requirements for telecommunications systems.

Alpha Technologies introduced a new line of broadband power systems for use in combined and full service network applications. Based on flexibility and modularity, the new BPS series consists of an array of integrated powering components and packaging options.

The BPS series can be programmed to provide 90-, 75- or 60-volt output, and several components can be custom mixed and matched to provide an optimum solution for the network.

This allows centralized power systems to be built from the same components used to power a single feeder line, for example. As a result, operations, status monitoring, power supply modules and interfaces can remain standardized across the entire plant.

The status monitoring system is designed to work with any commercial and/or proprietary system available. It provides more than 100 different test functions and real-time data to the network manager.

Alpha also debuted the Power Mux, a 60-volt AC/48-volt DC multiplexing power supply to facilitate remote powering of 48 VDC telephony equipment from cable TV networks by rectifying and conditioning 60 VAC power from a cable trunk.

In addition, Alpha debuted a new 90-volt version of its XM Series CableUPS power supply. The new version addresses end-of-line voltage loss problems associated with some cable systems. It can also be used to reduce the number of power supplies needed in a system.

Telewire Supply and Antronix announced new subscriber powering and downstream uninterruptible service for Antronix' Milenium 2000 Series multitaps and line passives.

Voltage Control System (VCS) announced the OMEGA 1, an online uninterruptible power supply for line CATV operation. OMEGA 1 was designed in a cooperative venture between VCS and Litton Industry's Space Systems Operations Division. The power supply is capable of 60 VAC operation for existing plant and is upgradable to 90 VAC, without changing hardware, by field personnel.

A Battery Management Sub-System monitors and records battery activity, and depending on the types of discharge required of the battery system, the BMSS will logically bulk recharge on float charge the system while monitoring all aspects of battery condition.

Subscriber equipment

Zenith Electronics Corp. showed the advanced diagnostic applications now available both through the MM2500 set-top and the Command Series Controller headend processor.

Using a new application-specific integrated circuit, the MM2500 offers immediate, on-screen network/set-top diagnostic capability in the home.

Zenith has also announced that it has built the Simple Network Management Protocol (SNMP) management system directly into its new HomeWorks Universal two-way cable modem.

General Instrument demonstrated at Expo its new Interactive Digital Terminal, the IDT 1000, the first in a series of interactive digital terminals that will provide different levels of functionality and performance.

As part of the demo, the IDT decoded MPEG-2 data carried in MPEG-2 transport streams. Using an IR remote control, the IDT 1000 can interactively switch transport streams, demonstrating video-on-demand functionality.

Also featured at the GI booth was a simulation of the company's Broadband Interactive Network. The simulator is being used by GI system engineers in Hatboro, Pa. to verify system and product designs and predict network performance under various loading and use conditions. It runs on a Sun Workstation and uses a multiple-window animated display of the network to show functions.

And ABC introduced its newest remote control, dubbed The ProMote III. It's a 3-in-1 universal style remote with individual overlays for every major brand of set-top.

Equipment enclosures

Manufacturers also showcased various protective enclosures to shelter cable equipment.

Channell Commercial Corp. announced the availability of its new line of pedestals, the

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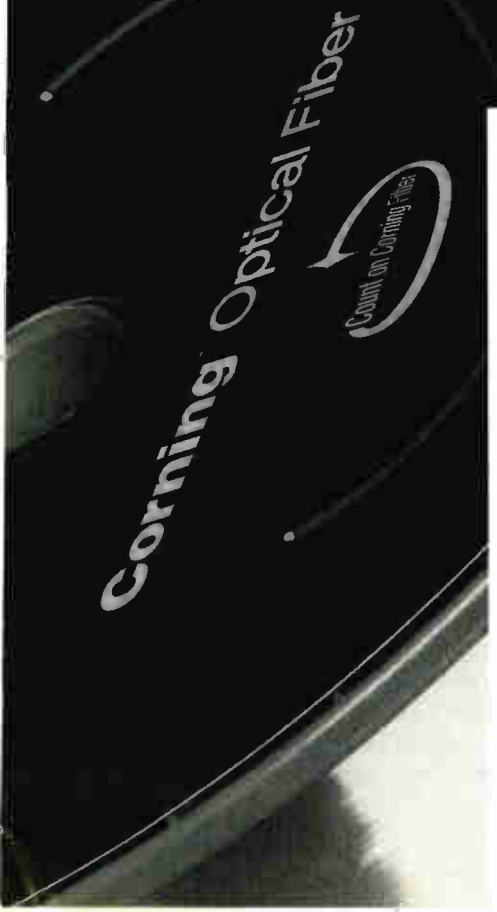

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Cadix International released new cable management software that merges fiber or RF design and analysis data with business application files to provide the tools for enterprise-wide database management.

Based on a client/server model, the FX-7001-CM series allows design data elements to be shared throughout a system, and designs based on Cadix software can be imported to construct management information. A record is created for every piece of network equipment, and up to 250 field photographs can be attached to a single graphic element via a multimedia database.

Telecommunication Programming & Services Corp. introduced its CLIde signal leakage management system for Windows at Cable-Tec Expo. The system is a program that receives input from most signal leakage meters and fully manages the signal leakage program, including graphical analysis, creation of work orders, historical tracking of signal leakage data and a range of management reports.

Training programs

Need training in the magical world of data technology? Look no further. LANcity Corp. has announced it will offer LANcity University seminars, hands-on training for cable operators in new data communications and cable TV services, plus practical guidelines and procedures for remotely installing, managing and troubleshooting data over cable TV technology. Key subject areas will include data connectivity, network operations and reliability and performance.

Client-companies and employee-students can now utilize automated direct access to the National Cable Television Institute (NCTI) Student Services Department. The new NCTI service is called Student Service EXPRESS. Using a dial-in system at (303) 797-9373, users can obtain info beyond office hours.

NCTI has also announced new interactive training products. The institute is now offering a new Train-the-Trainer Program, Facilitator Guides, facilitator-led Hands-on Labs and three-dimensional Broadband Interactive Training Modules.

Business announcements, literature

LECTRO announced that the CableShoppe Inc. has become its first in and out of warranty repair facility. The CableShoppe will repair Lectro's Sentry and SuperSentry power supplies.

And SeaChange Technology Inc. chose Expo as its venue to announce that Bruce Mann has joined the company as vice president of network storage engineering. Mann is responsible for the company's ongoing development of advanced network storage systems designed for video applications.

Finally, Sprint/North Supply introduced its new CATV/Broadband Catalog, which features thousands of products from major manufacturers and includes a full range of coaxial cable, connectors, distribution equipment, drop materials, fiber optics, headend, outside plant, test equipment, tools and supplies. CED

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☐ a. Management ☐ c. Technical Mgmnt ☐ e. Technical
☐ b. Engineering Mgmnt ☐ d. Engineering ☐ f. Other _____

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☐ 1a. Independent Cable TV System
☐ 1b. MSO (two or more Cable TV Systems)
☐ 2. Cable TV Contractor
☐ 3. Cable TV Program Network
☐ 4. SMATV or DBS Operator
☐ 5. MDS, STV, or LPTV Operator
☐ 6a. Microwave Company
☐ 6b. Local Telephone Co.
☐ 6c. Regional Bell Operating Co.
☐ 6d. Long Distance Telephone Co.
☐ 6e. Cellular Telephone Co.
☐ 7. Commercial Television Broadcaster
☐ 8. Cable TV Component Mfg
☐ 9. Cable TV Investor
☐ 10. Financial Institution, Broker or Consultant
☐ 11. Law Firm or Government Agy
☐ 12. Program Producer, Distributor, Syndicator
☐ 13. Advertising agency
☐ 14. Educational TV Station, School or Library
☐ 15. Telecommunications Consulting Firm
☐ 16. Local Area Network End-User
☐ 17. Local Area Network Equipment / Services Supplier
☐ 20. Satellite Communications Services/ Common CarrierFirm
☐ 21. Telephone Equipment Mfg/Distributor
☐ 18. Others Allied to the field _____ (please specify)

❸ Are you a member of SCTE? ☐ Yes ☐ No

❹ In the performance of your job, check the product categories you authorize, specify or purchase. (check all that apply)

☐ a. Subscriber Equipment
☐ b. Fiber Optic Equipment
☐ c. Test Equipment
☐ d. Distribution Equipment
☐ e. Headend Equipment
☐ f. Contractor/Construction Svcs
☐ h. Telephone Equipment
☐ j. Advanced Networking Eqmt
☐ k. Data Equipment
☐ l. Production Equipment
☐ g. Other (please specify) _____

❺ What is the approximate dollar value of the annual budget you are responsible for?

☐ a. over 1,000,000
☐ b. 500,000 - 1,000,000
☐ c. 250,000 - 500,000
☐ d. 100,000 - 250,000
☐ e. 50,000 - 100,000
☐ f. less than 50,000

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Cable data in tandem with online services

Explosive synergies

By Fred Dawson

Developments in data and broadband communications are fueling each other at a remarkable pace, setting the stage for an explosive market synergy between cable access and a new generation of consumer-oriented online services in the year ahead.

While six months ago, the cable industry was merely thinking about the possibilities, with no certainty about the availability and type of equipment to be used, today, MSOs are moving quickly toward consensus on the key technical issues that must be resolved to ensure the most cost-efficient approach to rolling out services. And, in the online sector, activity focused on making the Internet and online services in general more commercially viable has opened the way for delivering virtually any type of service imagineable within the data stream, including voice and videoconferencing, video games, music videos and movies, as well as more appealing versions of the traditional data services.

"We'll see the fastest rollout of technology we've ever witnessed in the cable industry," predicts Scott Kurnit, president of the new MCI Information Services Co., which is in the market with InternetMCI. "We see a very smooth migration from today's Internet to the time when broadband makes video on demand over the Internet a standard piece of the service venue."

Tech consensus

As reported in this space last month, vendors responded to rising industry demand with an outpouring of modem options at the NCTA convention in May. Now, says Scott Bachman, vice president for operations technologies projects at Cable Television Laboratories, MSOs are beginning to make choices through the CableLabs RFP process that should make it possible to meet ambitious price and rollout targets set by member MSOs.

"We still have some philosophical differences," Bachman says, "but most people favor an asymmetric approach as the best way to get started in the business."

Right now, he adds, a consensus is shaping up around a two-phase implementation of broadband data technology, where the first-phase service would support a minimum peak burst of 10 megabits per second in the downstream, with the rate for upstream set at anywhere from 500 kilobits per second to 5 Mbps. Later, in phase 2, equipment would support operations and billing for services that would be fully symmetrical LAN extensions, such as work-at-home, as well as the asymmetrical online and Internet access services.

"Companies are anxious to get into this business as soon as possible," Bachman notes. "I'm pretty confident manufacturers can ramp up to meet the MSO schedules for trials by the fourth quarter. It's a little harder to predict the timing for commercial production levels, but we expect this to move quickly, given the level of demand that's out there."

That confidence is echoed by Tony Werner, vice president of engineering at Tele-Communications Inc. "We'll be into the thousands of deployed modems by the end of this year, and we expect to have close to a million boxes in the field by the end of '96," he says.

As part of its new @Home service, TCI, capitalizing on its new relationship with Sprint, plans to offer other MSOs as well as its own systems an international high-speed Internet backbone access, what Werner calls "an Internet overbuild," to ensure rapid data throughput over cable end to end. "We'll have points of crossover to Internet backbone throughout the world, with large amounts of cache memory at those points," he adds.

While plans are still in flux, Werner says it looks like TCI's @Home data service will be priced at about $30 per month for access to online and Internet services, with a 6 MHz data channel delivering 30 Mbps over the downstream of each 300-home coaxial bus in the upgraded network. The system will probably use a 10 base T connection, which allows dynamic bandwidth assignment of up to 10 megabits per modem. Upstream output per modem will probably be 1.5 Mbps.

This is the consensus configuration for what Bachman describes as "phase 1." Whether or not other MSOs choose to take advantage of the @Home high-speed backbone, it is now clear that all of the top 10 MSOs are ramping up to launch a phase 1-type service by early '96.

Werner says TCI, which is testing a more advanced symmetric LAN extension type service for telecommuting, will probably price such connections at about $500 per month. This is the type of service that would be supported by technology in the phase 2 portion of the CableLabs RFP approach, which will require more upstream bandwidth, a means to assign highly varied types of services to different customers in any given service area, and billing capabilities that minimize back-office headaches in the complicated, fast-moving data business.

Secure transactions

As cable prepares to launch broadband data access, a revolution is underway in the online sector, with preparations for a much more consumer oriented commercial product base extending to virtually all facets of the business. Nowhere is this change more significant than in the pursuit of the encryption technology that will be required to secure commercial transactions in the wide-open Internet environment.

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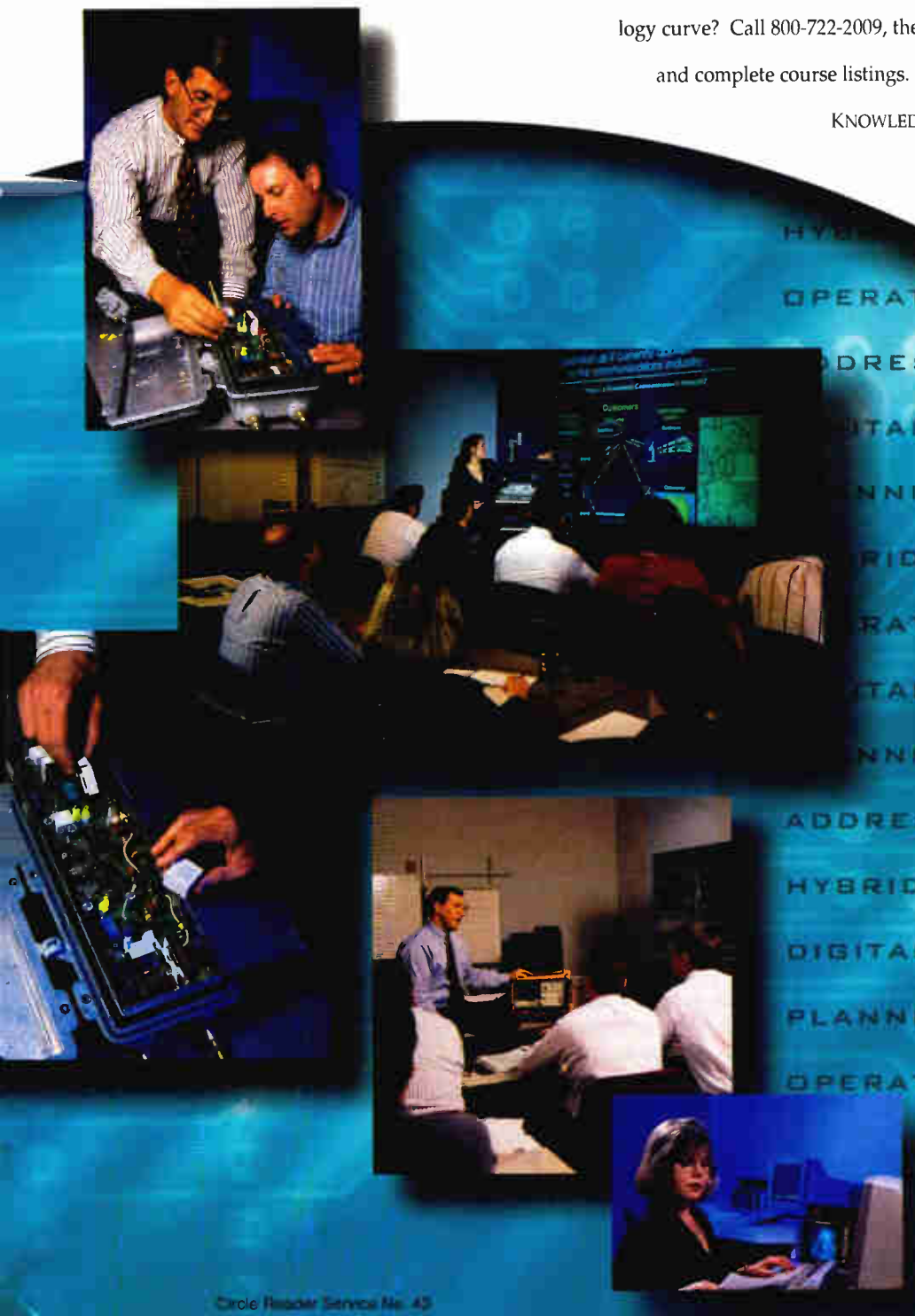

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"Transparency among Web sites is critical to market development"

World Wide Web users have come to terms on a way to integrate their technologies, avoiding a potential logjam to the marketing of commercial services over the Internet. "One of the problems for developers and end users of commercial Internet services has been that they have to choose between two security technologies," says Patrick McGill, vice president of sales and marketing for Terisa Systems, a joint venture between RSA Data Security Inc. and Enterprise Integration Technologies, a developer of technologies supporting commercial use of the Internet. "This agreement will lead to a core security system that is pervasive and transparent to the end user."

Parties to the agreement include America Online, CompuServe, IBM, Terisa and Internet software supplier Netscape Communications. They are spending an undisclosed sum to combine the RSA-based security system known as Secure HTTP (HyperText Transfer Protocol) and Netscape's SSL (Secure Sockets Layer) into a universal approach to Internet security, making it easier for information providers to encrypt information, and for consumers to access it.

Under terms of the letter of intent, AOL, CompuServe, IBM and Netscape intend to become equity holders in Terisa. In addition, Prodigy has indicated an intent to become an adopter and implementor of Terisa technologies.

"Transparency among Web sites is critical to market development," says David Kaiser, vice president of Websoft, a subsidiary of AOL. "Not to be able to get data from a server because your browser employs an incompatible security system sends a terrible message to the user."

While Netscape, with widespread distribution of its adaptations of Mosaic hypertext, has sparked a stampede of commercial enterprises into the World Wide Web environment, the success of the "bullet-proof" encryption system supplied by Terisa has been "a rock in Netscape's shoe," Kaiser notes. "It appeared to be shaping up as a messy battle."

Mark Andressen, vice president of technology and co-founder of Netscape with ex-Silicon Graphics CEO and founder Jim Clark, says it will be a relatively simple matter to combine the two systems because they operate in different spaces, with Secure HTTP residing in the application layer and SSL at the transport level. "Key management is similar," he says. "And the two protocol stacks share a tremendous amount of common code."

The parties say the first commercial products using the combined protocols should be available in this quarter. "We're probably only six months away from formal standardization," says Terisa CTO Allan Schiffman.

A new service paradigm

Resolution of transaction security issues is key to rollout of what MCI's Kurnit calls "third generation online services." Kurnit, a veteran cable programming executive who left Prodigy to head MCI's push into the online business, believes the pace of development in his sector is so strong that it will define the interactive landscape going into the next century.

"We're creating the first third-generation on-line service," Kurnit says. "My premise for some time has been that the Internet is the end game, and MCI represents an opportunity to act on that vision. The concept of open access using Internet standards plays extremely well as we move into the era of interactive TV."

MCI's opening gambit in the expanding Internet scenario relies on a combination of new browsing software and standards-based encryption technology to support secure purchases of easily accessed products without limiting suppliers or users to activity within InternetMCI, Kurnit says. "In the true Internet model, the providers do what they want to do," he notes. "We win hearts and minds with good support strategies."

While at Prodigy, Kurnit spearheaded that service's move into Internet access as well as efforts to create a wideband version of Prodigy for access over cable. But starting out with a cluster of services proprietary to a single on-line environment is not the way to exploit commercial opportunities taking shape in the Internet milieu, Kurnit says.

"What makes this the viable way to go is the fact that the four major components of Internet service, the network access point, browsing, network transport and content, are all disaggregated," Kurnit says. "This is not about locking you in as a content supplier or a user because we have the technical keys that can only be used if you're on our service."

The service employs new browser software developed by Netscape as an offshoot of Mosaic, the HTML (HyperText Markup Language) system that supports subject linking across some 10,000 databases residing at World Wide Web sites. The cluster of Windows-based support software also includes FTP Software's service development tools and RSA Data Security's encryption technology.

Two key components of the service are the MCI Home Page, a Web site interface that allows users click-on access to various directories, news groups and other categories, and MarketplaceMCI, a shopping center that can be accessed from any point on the Internet, including, most easily, the MCI Home Page.

While Kurnit pitches MCI's approach as one step ahead of the competition, it is clear that companies like Microsoft, AT&T, CompuServe, AOL, Prodigy and others are refining strategies on the fly in efforts to fit their business plans to the new market environment. In all cases, the new vision assumes synergy rather than conflict between the Internet and commercial services, which is something many experts didn't expect to happen for years to come.

"Nobody dreamed Netscape would have the impact it's had," says one senior online executive, speaking on background. "Bill Gates (Microsoft CEO) is having to reinvent the whole Microsoft Network strategy because he didn't see this coming."

Online service strategies

Fluidity of content between different online environments is vital to the strategy of AT&T's newly acquired

Interchange Online Network, says David Rollert, design director. "I think the proper relationship between commercial online publishing and the (World Wide) Web is, in effect, coexistence and interconnections back and forth between the two."

The Interchange server–based on Digital Equipment Corp.'s Alpha microprocessors–sits on the Internet and uses the Internet protocol TCP/IP. "Members will be able to use their direct Internet connections to access Interchange," says Michael Kolowich, president of AT&T Interchange Online Network. "Editors of Interchange services will be able to reach out to complementary material on the World Wide Web, viewed through a fully integrated HTML viewer-browser."

Next-generation online services will also facilitate the flow back and forth between commercial and free services by how they charge their clients, Kokowich says. "New pricing models will emerge–first from AT&T and Microsoft–which will be modeled on low base prices and pay-for-what-you-want subscription relationships, complemented by information transaction to meet one-shot needs."

While Interchange, which just launched after a long period in beta trial, is designed to support development of applications for today's narrowband network environment, it is ready for higher bandwidth applications as well, Rollert says. "The way Interchange is architected, as soon as bandwidth is there we can easily incorporate multimedia into any document or service," he says.

The same is true for the other next-generation services.

In fact, some services, not content with waiting for the bandwidth to get the ball rolling on video adjuncts to narrowband service, are turning to CD-ROM as a means of improving the graphic presentation. David Eastburn, vice president for business development at CompuServe, says his firm's success with graphic enhancement via CD-ROM support in the online environment has prompted efforts on the part of many CompuServe publishers to follow suit.

CompuServe, which has long offered an Internet access to its subscribers, is expanding the interface. Last year, the company opened inbound access to its services from the Internet and set up a CompuServe "home page" on the World Wide Web, allowing Web users to explore what the service has to offer. Now the service, following Prodigy's lead, provides members access to Web browsing capabilities without having to know underlying Internet commands. The Web entry via CompuServe operates at speeds up to 28.8 kilobits per second and is supported by security software that establishes "firewalls" around users' data to prevent unauthorized access.

Interactive graphics

Nothing is more important to the online revolution than more appealing environments for users, including the ability to interact with what's onscreen without waiting for endless downloads of static pages. Here again, the way is being paved in the narrowband arena for means that will be vital to a fast takeoff in broadband data.

Sun Microsystems has blasted a new development language into the Internet which aims to equip commercial service developers with a means to implement CD-ROM-like capabilities in the World Wide Web environment. The development language, known as "Java," and an attendant Web browser known as "HotJava," are part of a sweeping initiative by Sun that also includes release of a new security system, a new Internet server, administrative tools and "netware" capabilities, which pertain to collaborative computing.

Java has been quietly offered in alpha release over the Internet at no cost for about two-and-a-half months, says Kim Polese, product manager for Sun, and it is already being widely used in development of Web pages.

The Java language gives HotJava users the power to develop small, specialized software applications, or "applets," which are distributed to users as they click onto commands just as typical Web pages are downloaded. But the difference between the usual Web page and the applet is that the applet contains a short program that allows users to interact with what's on the page, rather than waiting for another page to download.

The capabilities within the applet are akin to what people can do with a CD-ROM, says Geof Katz, vice president of new electronic media technologies at Foote, Cone & Belding, which has begun using the browser in projects with a number of clients. "HotJava is much more graphically rich than what you usually see online," Katz says.

Katz, noting that Netscape Communications is now supporting the new Sun language, says he expects to see Java becoming the standard development language for the Internet very quickly. "We've got a lot of things going at a number of Web sites across North America, and they all use Java," he says.

The next-generation browser is the beginning of what promises to be a variety of approaches to taking the Internet to a level of functionality and interactivity once deemed impossible in today's narrowband environment. In fact, says Rob Schmults, spokesperson for Worlds Inc., another software system developer, HotJava doesn't even meet the criteria for interactivity which his firm has set.

"To us, interactivity means real-time interaction with other people online, not a download of something into your computer which you interact with," Schmults says. "Our tools allow people to build environments where interaction in 3-D takes place online."

Worlds' first release into the Internet is Worlds Chat, which allows people to communicate with each other using 3-D avatars which the company refers to as "Digital Actors."

Sun is talking with most of the major commercial online service providers in hopes of winning them over to Java, Polese says. "Whatever approach people take," she adds, "my guess is most, if not all Web browsers will be interactive within the next year or two." CED

Nothing is more important to the online revolution than more appealing environments for users

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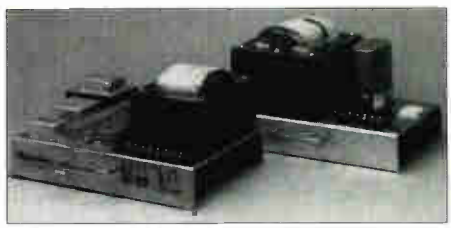

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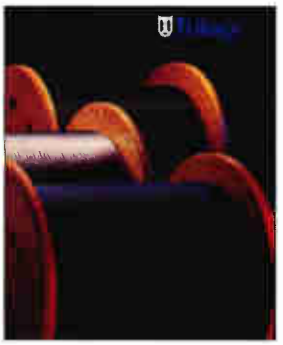

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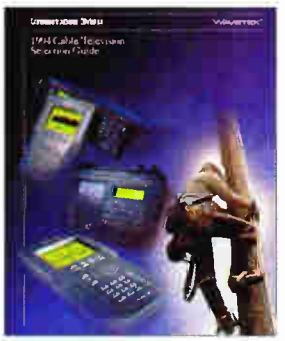

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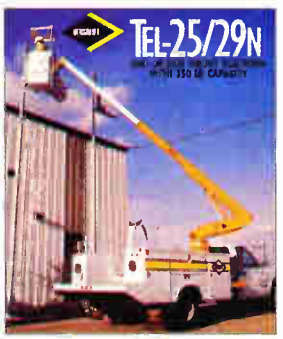

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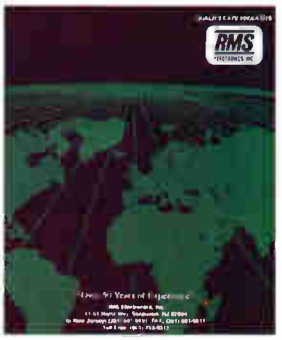

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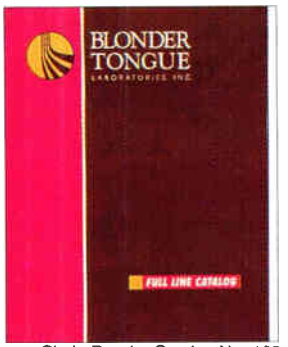

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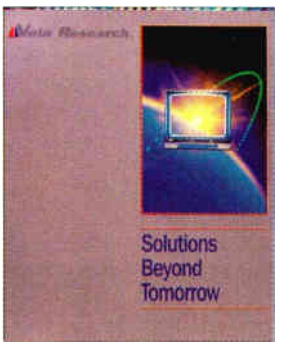

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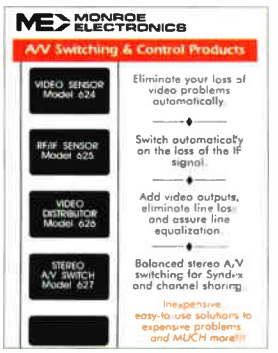

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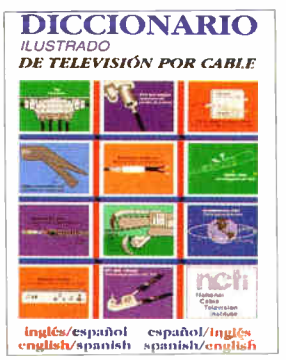
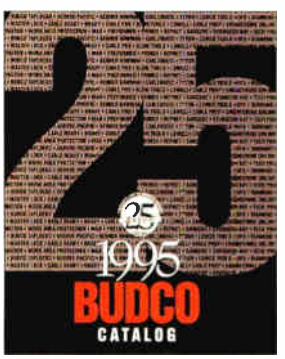
The National Cable Television Institute (NCTI) offers a new Spanish/English illustrated dictionary of cable television and broadband technology terms. The first section presents English terms with Spanish translation and Spanish definition. The second section offers Spanish terms with English translation and English definition. Cost $29.95 plus S/H; quantity discounts. Please contact: **NCTI**, 801 West Mineral Ave., Littleton, CO 80120-4501, (303) 797-9393, Fax (303) 797-9394.



Circle Reader Service No. 133

1995 FREE Budco Catalog

The 1995 Budco Catalog is packed with more products than ever before from fine names like: • Brady • Cable Pro • Diamond • F-Conn • Klein • Times Fiber • Ben Hughes Cable Prep • Cable Ready • Engineerig Unlimited • Jameson • Ripley Cablematic • Tyton • and many more. We will ship your stock orders within 24 hours. Call **Budco** at 1-800-331-2246 for your free catalog today.



Circle Reader Service No. 134

FlexNet™ . . . Ideal for Hybrid Fiber/Coax Networks

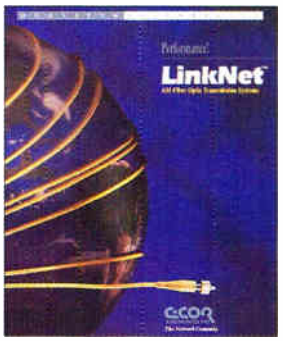
As worldwide voice, video, and data communications networks evolve, the need for flexible, reliable, cost-effective solutions grows. C-COR's FlexNet™ series of amplifiers is available in both 750 MHz and 550 MHz versions and has a 1 GHz platform for upgradability when networks expand. The FlexNet™ Series is backed by an extended warranty and C-COR's full line of technical customer services. Call **C-COR**, the Network Company, at 1-800-233-2267.

Circle Reader Service No. 135

High-Performance! LinkNet™ AM Fiber Optic System

LinkNet™, C-COR's new generation of AM fiber optic transmission equipment, features the high-performance Ortel® laser. Benefits include 750 MHz (80 channels + digital) capability on single or dual fibers, a redundant optical back-up, upgradable 1 GHz platform, and a network management option. LinkNet™ is ideally suited for a variety of fiber-rich architectures. Call **C-COR**, the Network Company, at 1-800-233-2267.

Ortel® is a registered trademark of Ortel Corporation.



Circle Reader Service No. 136

DRAKE VM2552 Stereo Video Modulator

Bring stereo audio into your cable system at an affordable cost. The Drake VM2552 modulator incorporates BTSC stereo encoding, providing a significant cost savings when compared to purchasing separate components. Professional noise reduction circuitry reproduces the BTSC signal with good stereo separation and audio fidelity. The frequency-agile VM2552 features frequency coverage up to 550 MHz with a powerful output of +60 dBmV. Contact Mr. Phillip Hawkins, **R.L. Drake Company**, (513) 847-4523.

Circle Reader Service No. 137

ESR1260 IRD Earth Station Receiver

The Drake ESR1260 IRD is a high quality commercial integrated receiver descrambler with synthesized frequency tuning of IF and subcarrier audio frequency. The VideoCipher® RS module can be accessed directly through the front panel, providing added convenience for the operator. Major operating functions are also selected via the front panel and programming is simplified with liquid crystal displays of operating parameters. The ESR1260 IRD's compact design optimizes valuable rack space. **R.L. Drake Co.** (513) 847-4523.

Circle Reader Service No. 138

Fiber Optics–Special Applications

Education, Business, Voice/Data, CATV, and Fiber Optics, 6 terms not often thought of at the same time,–*UNTIL NOW*. Selecting the most cost-effective products for these unique fiber applications is essential for their success. If you are in the various stages of implementation, it's not too late to call for the most cost-effective products for these unique applications. *GUARANTEED!* Call for your free copy of our white paper on these applications. **Cable Technologies International**, (215) 657-3300, FAX (215) 657-9578.

Circle Reader Service No. 139

The Clicker Family

The **Clicker Family**, a unique, simple to use 2, 3 and 4 function family of universal remotes that includes the most extensive library of cable codes on the market today. Are you suffering from: Sagging revenue streams? Confused subscribers? Too many different remotes? Complex remote operation? Too many buttons? Then your solution is...*The* **Clicker Family**. A family of universal remotes for your video and cable needs. Available for immediate delivery only from **Cable Technologies Int'l., Inc.**, (215) 657-3300, Fax (215) 657-9578

Circle Reader Service No. 140

Cable Security™ provides Ultimate MDU Security Package

Cable Security manufacturers of the Beast™ box and distributors of Cable Ready™ ultra high security steel molding has merged the products together for the ultimate MDU security application. When these product groups are used together they will supply the Telecommunication Industry with the highest security level for multiple dwelling units available today. Please call 1-800-288-1507.

Circle Reader Service No. 141

FREE Catalog for Powering Broadband Networks

Power Guard is the leader in providing powering solutions for advanced broadband networks. If you're building a CATV plant or an advanced broadband network carrying voice, video and data we have a power supply to meet your requirements. Power Guard can offer the most technically advanced, cost-effective systems on the market, because we have invested more toward research and development than all of our competitors combined. For a free catalog and to see how we can help call **1-800-288-1507**.

Circle Reader Service No. 142

ADC Frameworx Fiber Frame Architecture

This complete package contains information on ADC's integrated approach to total fiber distribution frame cable management. Frameworx is a platform on which service providers can build a total fiber distribution frame management system that provides automated record keeping, remote test capabilities, patch cord traceability, optical amplification and advanced circuit schematics such as signal monitoring, switching, attenuation and wavelength division multiplexing. **ADC Telecommunications** (800) 366-3891.

Circle Reader Service No. 143

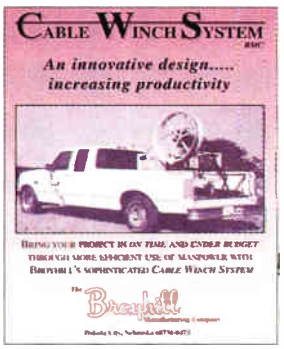
Scientific-Atlanta's complete line of broadband systems

Scientific-Atlanta's 1994 Broadband Communications Products Catalog is available from your local **Scientific-Atlanta** sales representative, by calling 800-722-2009 or writing Bill Brobst at 4261 Communications Drive, Norcross, GA 30093. The catalog carries up-to-date information on Scientific-Atlanta's complete line of broadband systems and cable TV equipment. There's digital compression, telephony over cable, headend, distribution and fiber optics electronics as well as subscriber products including home communications terminals and management systems. We have what you need.

Circle Reader Service No. 144

Broyhill–Cable Placement Winches

We challenged our engineers to come up with a winch that includes convenience and affordability and the most accurate charted pull force–ever. Now you can pull aerially or underground; fiber or coaxial and accurately chart force on paper or PCMCIA cards. Call, fax or E-mail **The Broyhill Company** for more information: WATS 1-800-228-1003, FAX 1-402-987-3601.
URL: http://www.stouxian.com/broyhill
E-MAIL: Broyhilsal@aol.com



Circle Reader Service No. 145

Sprint/North Supply CATV Catalogs

Sprint/North Supply is a leading nationwide provider of integrated solutions for voice, data, teleconferencing and CATV product needs through its 11 strategically located distribution centers. We offer more than 30,000 products from over 1,200 manufacturers. Let us show you a sample. Ask for our new broadband catalog containing thousands of products from 97 suppliers. Ask, too, about the following catalogs: Fiber Optics, Outside Plant, Tools, Test and Supplies, and Security Products. 800-639-CATV, FAX 800-755-0556.

Circle Reader Service No. 146

The Cable Tool Innovators

Ripley Company's Cablematic Division offers a complete catalog in cable preparation tools. The catalog displays tools for jacket and sheath stripping, simultaneous coring and stripping, hex and round full-cycle crimping, plus many specialty tools including fiberoptic tools and cable expanding kits. Using proper tools promotes system reliability and assures safe, fast, accurate cable preparation. Call now 1-800-528-8665 for your free catalog. **Ripley Company, Cablematic Division,** Phone (203) 635-2200, Fax (203) 635-3631

Circle Reader Service No. 147

The Fiber You Choose Makes a Difference!

To learn more, order the FREE "Corning Fiber Advantage" brochure. Cable TV operators, here's your chance to get the facts about Corning optical fiber. Discover why your choice of fiber is critical and how fiber geometry–the physical dimensions of the glass–can result in low-loss splices, the first time, virtually every time. **Corning** wrote the book on optical fiber. Now it's available by calling 1-800-525-2524 ext. 543. Ask for the "Corning Fiber Advantage" brochure.

Circle Reader Service No. 148

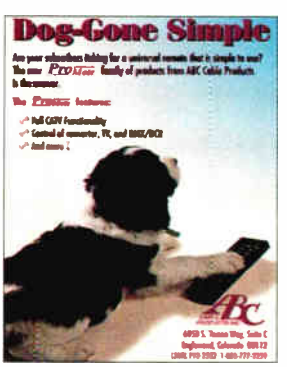
NEW! Amplifier Catalog

Viewsonics Inc. full color amplifiers catalog contains photos and specifications of all their amplifiers, including the newest mini tubular amps with 10dB and 15dB gain, the mini 2-way amp, and the 35dB amp with a noise figure at 3.5dB. You'll find their amps all over the world including places you've never heard of, so call and/or fax for your free Viewsonics Amplifier Catalog today.

Circle Reader Service No. 149

Simple to USE Remotes and Optical Links

Call **ABC Cable Products** now for information on are complete line of quality dedicated and universal remote control units that are cost-effective and simple to use. Our latest addition, the ProMote family of universal remotes have the capability of operating CATV converters, TV's and VCR's. Our fiber optic transmitters and receivers, the CBlinX, transport point-to-point video, audio, and data where high performance is required. Call now and let ABC make your job simpler! 1-800-777-2259.



Circle Reader Service No. 150

Don't choose just a Cable Prep tool. . . choose Cable Prep—The Company

Since 1979 **Ben Hughes Communication Products** has been manufacturing a full line of Cable Prep® tools for the cable industry. The hex crimp tool line includes those made for fiber optic cables, CATV, MATV, STV and standard RF connector applications. A complete line of coring, stripping/coring and jacket stripper tools are available. Special tools can be made to order. For more information call (203) 526-4337or Fax (203) 526-2291.

Circle Reader Service No. 151

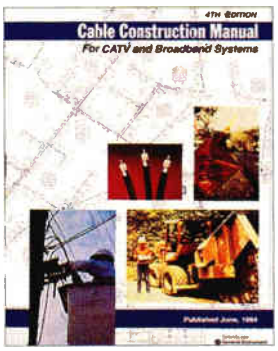
Lectro's Zero Transfer Time Power Supplies

Lectro's no break, no data loss ZTT/UPS power supplies are designed to meet all your network requirements. Our reliable 24, 36, & 48 VDC units are available in 6, 9, 12, & 15 amp models. All units provide a highly regulated 60 Hz over a wide load range in AC and DC modes and are status monitoring capable. For information on our full line of products, please contact:
Lectro Products
P.O. Box 567, Athens, GA 30603
1-800-551-3790 Phone
1-706-548-5493 Fax.

Circle Reader Service No. 152

Cable Construction Manual for CATV Broadband Systems

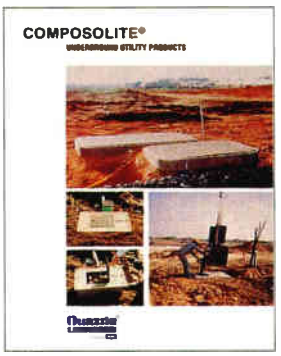
CommScope is now making available a revised and updated edition of its widely distributed and used Cable Construction Manual for CATV and Broadband Systems. The new manual includes sections on storage, testing and construction procedures for coaxial trunk and distribution cables in aerial and subsurface applications, fiber optic cables as well as safety procedures. For more information, call **CommScope/GI** (800) 982-1708.



Circle Reader Service No. 153

New Catalog for Underground Utility Products

Lenoir City, TN–**COMPOSOLITE®** polymer concrete underground utility products by Quazite are lightweight (for reduced installation costs), strong and reliable. Proven performance in servicing CATV, telephone and electrical facilities, install it and forget it. A wide range of splice/pull boxes with light and heavy duty designs are available. Call **1-800-346-3062** for our **FREE** catalog. **QUAZITE** 3621 Industrial Park Dr., Lenoir City, TN 37771



Circle Reader Service No. 154

Cable Leakage Technologies, Inc.

CABLE LEAKAGE TECHNOLOGIES (1-800-783-8878) offers a new family of **WAVETRACKER** products. The **WAVETRACKER** system has undergone major enhancements, with a new compact size, a VGA quality LCD display, and a **NEW LOW PRICE. CLT's** new **Windows™ based A.P.L.A.S. Software** offers **ONE STEP** data processing, using the **newest, most current mapping product available.** The **DELTAWAVE** Differential G.P.S. Base Station now offers 2 to 5 meters accuracy.

Circle Reader Service No. 155

Products . . . flexible, reliable and affordable

Triple Crown manufactures the Titan Series trunk/bridger amplifiers, AM fiber transmitters and receivers, Minex Series indoor/outdoor distribution amplifiers, LA Series dual hybrid line extenders and subscriber drop amplifiers. All amplifiers are available in a wide range of gains and bandwidths, in all international powering formats. Hotel, hospital pay-per-view systems, with interactive services. For more information call (905) 629-1111.

Circle Reader Service No. 156

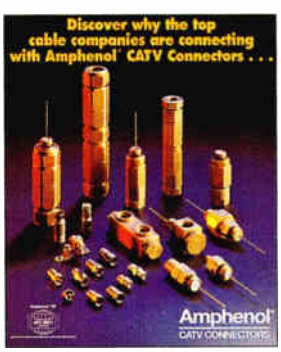
Intelligent Solutions for Intelligent Networks

Philips Broadband Networks, Inc. certified ISO`-9001 manufacturer & supplier of highest quality broadband distribution equipment & systems. Application products: one- & two-way amplifier systems, fiber optic equipment, signal processing equipment, telephone & data communications gateways, video servers & digital set-top decoders, echo cancelling equipment, interdiction systems, network monitoring systems, passives & connectors. Services: System design, rebuild analysis, pre-racking of optical equipment, training & field engineering. Call (315) 682-910 for info.

Circle Reader Service No. 157

New Technical Brochure–CATV Connectors

Amphenol® CATV Connectors, a division of Amphenol Corporation is a leading manufacturer for the worldwide RF connector market. Designed for use in CATV trunk and feeder system applications, Amphenol delivers a superior product–a 40 dB return loss @ 1GHz and 0.2dB maximum attenuation–at a competitive price. The Hardline Gold Series CATV Connectors will save installation time, enhance the quality of your connections and provide years of installed performance. For more information, call 800-881-9913 or fax at (203) 796-2091.

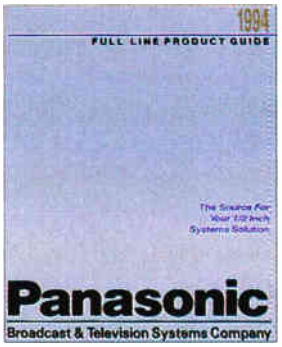


Circle Reader Service No. 158

Panasonic Full Line Product Guide

This Product Guide is for Panasonic's Audio/Video product line that includes: Cameras, VTR's and Monitors. Explanations are given on advantages, and facts for features and specifications of D-3, M II and S-VHS products. Includes all new products such as Supercam and the AG-DS850, S-VHS, HI-FI, Editing, Recorder-Player with Digital Slow.

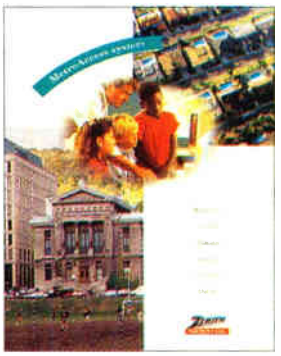
Panasonic Broadcast & Television Systems Company
Phone (201) 392-4709
Fax (201) 392-6821



Circle Reader Service No. 159

Zenith's MetroAccess™ System

MetroAccess is a complete, cost-efficient family of RF data communicaiton products from **Zenith Electronics Corporation**. It uses proven, high-speed technology for hybrid fiber/coax systems linking businesses, communities, schools and residences for a wide range of applications including work-at-home, distance learning, real-time videoconferencing, Internet access and on-line services. For more information, call 1-800-788-7244.



Circle Reader Service No. 160

Revenue-Generating MM2500 Set-top

Zenith Electronics Corporation's MM2500 set-top unit features real-time, two-way interaction, in-band transmission of conditional access data, baseband SSAVI scrambling and unlimited pay-per-view control. The MM2500 is a powerful, all-purpose analog set-top device that gives network providers full and diverse control from the headend. For more information, call 1-800-788-7244.

Circle Reader Service No. 161

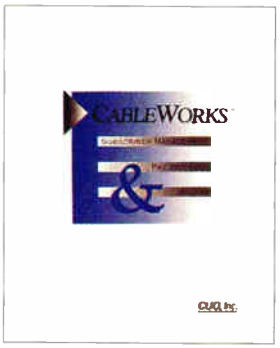
A Serious Revenue Generator

Zenith Electronics Corporation's new ScreenPlay™ authoring tool is an innovative approach that combines speed, flexibility, customized on-screen displays and interactive capabilities with set-top device technology. ScreenPlay is the only analog, PC-based dialogue authoring tool that offers the ability to quickly generate, modify and edit on-screen displays and applications. For more information, call 1-800-788-7244.

Circle Reader Service No. 162

Subscriber Management, Billing and Pay-Per-View System

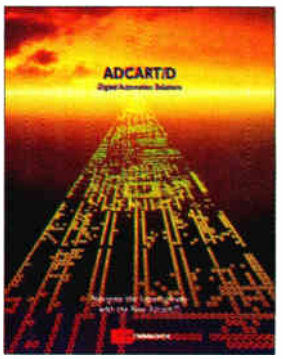
CableWorks™ from **CUO, Inc.** is an easy-to-use subscriber management, billing and pay-per-view system that is ideal for small to medium operations. A flexible, global product, *CableWorks* features national language support for quick foreign language conversion. In addition to enhanced reporting and standard applications integration, *CableWorks* expands readily to accommodate more stations or more subscribers. For a free demonstration disk, circle this reader service number or call (800) 541-8825.



Circle Reader Service No. 163

Digital Ad Insertion Solutions

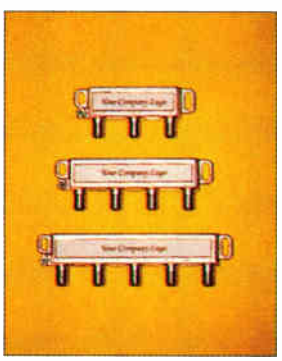
Local market dynamics dictate technological approaches You need a solution that's right for you today with an expansion path towards the future. Channelmatic's Adcart/D offers you MPEG I, MPEG II and the latest from SONY, the VideoStore Media Server. For an automation solution that will support you today and tomorrow, look to **Channelmatic,** The Global Leader in Ad Insertion. Call (800) 766-7171 or (619) 445-2691.



Circle Reader Service No. 164

McGuire Communications Inc.

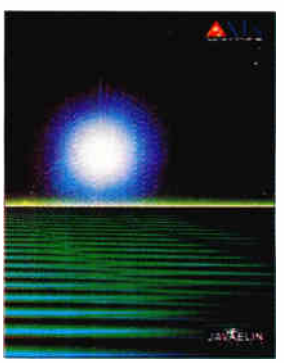
McGuire Communications is proud to present the Vertex Vertical Splitter. This one of a kind, 1 Ghz splitter has all of its ports on one side. It allows for a standard and unique form of installation. The Vertex Splitter will allow Cable TV operators to upgrade their systems to compete in future technological applications. For more information call 617-391-3277 or see us at the New England Cable TV Convention in Newport, RI on July 25th & 26th.



Circle Reader Service No. 165

FREE Brochure on Javelin Series

ATx Telecom Systems, Inc., is a leading manufacturer of broadband video transport equipment. The Javelin 1550 Series includes the 1550-nm optical fiber amplifier featuring dual pumps and redundant power supplies for high reliability. With output power of +21 dBm, the amplifier enables architectures which consolidate headends and distribute signals more economically. For a brochure on the Javelin Series, please contact ATx at (708) 778-2900; fax (708) 369-4299.



Circle Reader Service No. 166

Optical attenuator

OEC-104 calibrated optoelectronic reference convertor module

MORRISVILLE, N.C.–Wandel & Goltermann has added the OLA-15 optical attenuator to its line of handheld fiber optic test equipment. The OLA-15 is aimed at single-mode measurements at wavelengths of 1310 and 1550 nm and features a total wavelength range of 1260 to 1600 nm. It has the advantage of providing continuous, rather than incremental attenuation from 3 to 60 dB with display resolution of 0.05 dB.

The portable instrument is ideal for on-site measurements of transmitted signal strength, signal path attenuation, receiver sensitivity and Bit-Error-Rate (BER). The unit is designed for bidirectional operation, with the two ports serving as either input or output, and return loss is better than 40 dB at either port.

The company has also upgraded the performance of its OMS-200 Optical Measurement System with the optional OEC-104 module. The OEC-104 calibrated optoelectronic reference convertor module simplifies measurements of SDH and Sonet optical transmitters over an optical wavelength from 1200 to 1600 nm. It supports testing of systems operating at data rates of 155.52 Mbps and 622.08 Mbps by linearly converting optical signals to electrical signals.

With the OEC-14 option installed, the OMS-200 is transformed into a programmable SDH/Sonet reference receiver which can generate eye-pattern and extinction-ratio displays on an oscilloscope. The OEC-14 module contains the two filters required for testing at high-speed data rates of 155.52 Mbps and 622.08 Mbps, as well as an InGaAs-photodiode-based optical power meter capable of measuring levels from -70 to +3 dBm (1nW to 2 mW).

Circle Reader Service number 50

Deluxe Power Meter

Power meter

ORISKANY, N.Y.–New to Fiber Instrument Sales' line of fiber optic products is the Deluxe Power Meter. The handheld unit provides zero offset capability for direct loss readout of fiber under test.

The FIS meter offers six selectable wavelengths:

Portable locator

670 nm, 780 nm, 850 nm, 1300 nm, 1310 nm and 1550 nm with 0.01 dBm resolution. Readout power in dBm, dB and watts. The unit comes with a power supply and adapter and is packaged in a rugged black plastic holding case.

Circle Reader Service number 51

Power protection

GOLETA, Calif.–Joslyn Electronic Systems Corp. has announced three new products. The first is the JES356 H Hybrid Station Protector, which provides balanced protection against lightning surges, power-cross conditions and ground potential rises at the subscriber premises.

The protector element consists of a heavy-duty-rated, three electrode gas tube with an external MOV backup device, and a patent-pending shorting mechanism for both lines. It provides the fast response of MOVs and the high energy handling capabilities of gas tubes.

Joslyn has also introduced the 1740 Series of Primary Coaxial Surge Protectors for broadband applications. The 1740-01-H18 coaxial protector provides protection against surges on 75 ohm coax subscriber drops and has a fail-short mechanism in the event of dangerous power crosses. The protection will pass bi-directional signals over a bandwidth from DC to 1 GHz, and has an insertion loss of < 0.15 dB, and a return loss of >20 dB over the entire bandwidth. It is constructed with a metal cast housing and "F" port interfaces, and measures 3.2 inches long by 1.5 inches high.

And finally, the third newly-released product is the 7090 series of Coax Capable Network Interface Devices. The series NID is designed for outdoor use in any single or multi-pair residential or commercial installation at the subscriber drop. It can be configured in twisted pair counts from 1 to 6, or 4 pair/2 coaxial lines. The device is made of high impact resistant, U.V. de-sensitized Suprel 9420. It is designed for simple installation and maintenance, and can be ordered factory configured or field retrofitted for coax.

Circle Reader Service number 52

Traps

SYRACUSE, N.Y.–Eagle Comtronics Inc. has introduced several new products, including

Rycom 8870 and 8875

RAYTOWN, Mo.–Rycom Instruments has introduced the 8875 Portable Locator, capable of pinpointing buried cable, pipe, wire and faults. The locator features push button depth, and can determine any buried conductor depth up to 15 feet.

Also new is Absolute Signal Strength, which simplifies path identification. Since the receiver is positioned over the target cable, the highest number displayed in peak mode and the lowest number in null mode identifies the cable path. Absolute Signal Strength can also identify a loss of signal to ground caused by damaged cable, find insulated pipe bushings or locate shorted pipes.

The 8875 is also available with rechargeable batteries, with an optional DC cigarette charger, which can recharge the batteries in two to three hours, and can provide power to the transmitter directly from the truck.

Circle Reader Service number 49

split-tuned negative traps which attenuate both video and audio for use with addressable descramblers that normally permit audio to come through. Appropriate in low volume situations, they can be installed indoors or outdoors. For high volume applications, Eagle's positive trap systems–discrete jamming carriers or sideband interdiction systems–can scramble the audio on the same channel with an addressable system.

In another product announcement, Eagle Tier Traps are now available at 1 GHz, for maximum compatibility with Eagle's 1 GHz single-channel traps.

Circle Reader Service number 53

Fiber optic software

BOSTON, Mass.–Fotec Inc. has introduced a new software product that tracks every component in a fiber optic network, including every fiber in every cable, every splice or connection, and even a full history of test data. FOdoc can be used in applications including: designing the cable plant, bidding jobs, installing the cables, and testing and archiving data on the cables. The software, called FOdoc, is a relational database that runs on PCs.

FOdoc will track up to 10 million records and allows "hot-key" insertion of sequential data and direct reading of test data from Fotec Smart Instruments. It generates reports on all the components in the networks, with special reports for estimating and troubleshooting. The "Path Report" will show exactly where a complete end-to-end cable run goes.

Circle Reader Service number 54

Fiber optic safety kit

BEREA, Ohio–The Clauss Fiberoptic/Telecom Division has introduced a safety kit designed specifically for those who work with fiber optic cable. Called the Fiber-Safe Fiberoptic Safety Kit, the five-piece set contains: a black vinyl polishing/work mat; a disposable trash can for fiber scraps; splinter removal tweezers; two-pronged swipes with self-contained alcohol dispenser; and wraparound safety glasses.

Circle Reader Service number 55

MPEG-2 encoder

LAS VEGAS, Nev.–Minerva Systems has introduced the Compressionist 200, an MPEG-2 publishing encoding system optimized for video server applications. Video professionals can leverage their artistic judgments using the Compressionist 200's "human-assisted" encoding tools to achieve superior image quality at data rates significantly lower than those required by "live" broadcast encoders.

The Compressionist 200 consists of a scalable, video pre-processing and encoding engine, a Macintosh-based host system and the MPEGmaker application software suite. The real-time video processing engine is capable of digital (D1) or analog (YUV) video input, high-quality audio capture, both MPEG-1 and MPEG-2 main level, main profile video encoding and MPEG layer 2 audio encoding.

In a related announcement, Minerva has also introduced the Picture Resampler, a video pre-processing module for its Compressionist product line. The resampler performs high-quality field or frame resizing, field reordering and de-interlacing in real time.

The resampler pre-processes the CCIR 601 resolution video input to the Minerva compression engine. Its spatial filters perform horizontal and vertical resizing of video fields or frames to support a variety of picture sizes and pixel aspect ratios including CD-i, Square Pixel and Video CD. When used in conjunction with the Minerva MPEG-2 encoder engine, the Picture Resampler supports a range of horizontal sampling rates from 352 to 704 pixels per scan line.

Circle Reader Service number 56

Fiber Test Manager and DocuNet system

Test data management

VANIER, Quebec–EXFO Electro-Optical Engineering has introduced the Fiber Test Manager (FTM) and DocuNet system for fiber test data documentation. FTM is a central database server that organizes all the OTDR traces and test data acquired in a fiber network every day. This approach to documentation automatically creates a database of test results based on the user's own fiber network topology. Results are directly archived according to their fiber's identification, cable and test location.

DocuNet is a field version of FTM. It is used to document and archive test results as they are collected from test instruments in the field. Once archived in DocuNet, test data can easily be retrieved for comparison, documentation or further analysis.

Circle Reader Service number 57

980 nm pumps

BURLINGTON, Mass.–Lasertron has announced increased coupling efficiency in its standard 980 nm pump lasers. The devices are typically used in optical amplifiers for fiber-based long distance telecommunications.

A re-engineering of the optical coupling between pump laser chip and optical fiber pigtail has resulted in a significant increase in the efficiency of the light launched from laser to fiber. As a result, at the typical laser current of 150 mA, output power is improved by one-third over the prior levels: from 63 mW to 84 mW.

Circle Reader Service number 58

Waveform monitor

HAUPPAUGE, N.Y.–Leader Instruments Corp. has released the LV5100D, a 4:2:2 component digital and analog waveform monitor that operates in 525/60 and 625/50 systems. It handles two serial component digital inputs and a three-channel analog component input for use in mixed digital/analog component facilities.

Circle Reader Service number 59

JULY

6 Cascade Range SCTE Chapter, Testing Session. Installer certification exams to be administered. Location: Columbia Cable office, Beaverton, Ore. Call Cindy Welsh (503) 667-9390.

7-9 Fotec's Fiber-U Conference. Location: Marlboro, Mass. Call Louise Downing at (617) 241-7810; or (800) 50-FIBER.

8 West Virginia Mountaineer SCTE Chapter, Testing Session. Certification exams to be administered. Call Steve Johnson (614) 894-3886.

9-11 1995 Oregon Cable Telecommunications Association Annual Convention. Location: Shilo Inn, Lincoln City, Ore. Call Carol Peters, OCTA at (503) 362-8838.

10-12 SCTE Introduction to Telephony Seminar. Location: Loews Giorgio Hotel, Denver, Colo. Presented by SCTE Director of Training Ralph Haimowitz. Seating is limited to 40 attendees. Call SCTE National Headquarters (610) 363-6888.

10-12 Fiber Optics 1-2-3: Installation, Maintenance, Design, produced by The Light Brigade Inc. This course includes eight hours of hands-on training with testing, splicing and connectorization workstations. Location: San Diego, Calif. Call Valerie Johnsen (206) 251-1240.

Trade Shows

August

13-15 Great Lakes Cable Expo. Location: Indianapolis, Ind. Call (317) 845-8100.

23-26 1995 Rocky Mountain Cable Television Expo. Location: Snowmass, CO. Call CCTA (303) 863-0084.

28-30 Eastern Cable Show. Location: Atlanta, Ga. Call the Southern Cable Television Association at (404) 255-1608.

10-13 Fiber Optic Installation & Splicing, Maintenance & Restoration for CATV Applications, produced by Siecor Corp. Location: Hickory, N.C. Call (800) 743-2671, ext. 5998.

11 Cascade Range SCTE Chapter, Testing Session. BCT/E certification exams to be administered. Location: Lincoln City, Ore. Call Cindy Welsh (503) 667-9390.

11 Chattahoochee SCTE Chapter, Technical Seminar. Topic: "Short detection/surge protection," with Bill Brookheiser of Cable Innovations; "Utility protection," with M.T. Miller of UPC; and "Drop bonding and grounding," with Marshall Money of Southern Multimedia Communications. Call Greg Worthman (404) 874-8000 x250.

11 Desert SCTE Chapter, Technical Seminar. Topic: "Fiber Systems and Technology—BCT/E Category III Tutorial," with speaker to be announced. Location: El Rancho, Beaumont, Calif. Call Bruce Wedeking (909) 677-2147.

13 SCTE Satellite Tele-Seminar Program. To be transmitted on Galaxy 1R, Transponder 14, 2:30-3:30 p.m. Eastern time. Topic: "Advances in System Architectures (Part II)," from Expo '94 in St. Louis. Call SCTE National Headquarters (610) 363-6888.

13-15 SCTE Technology for Technicians II. Location: Loews Giorgio Hotel, Denver, Colo. Presented by SCTE Director of Training Ralph Haimowitz. Seating is limited to 40 attendees. Call SCTE National Headquarters (610) 363-6888.

17-19 Wireless Cable '95, sponsored by Wireless International. Location: Grand Hyatt Washington/Convention Center. Call (319) 752-8336.

17-20 Fiber Optics System Training (FOST), produced by Antec's Fiberworks. Location: Denver, Colo. Call (800) FIBER-ME (800-342-3763) for more information and updated class schedules.

17-21 Broadband Communications Network Design, produced by General Instrument. A five-day training course that includes a high-level overview of the broadband network, with a special focus on operational theory and design. Call (215) 830-5678 for details.

24-25 Broadband Cable Television Technology, produced by Antec's Fiberworks. Location: Denver, Colo. Call (800) FIBER-ME (800-342-3763) for more information.

24-27 Fiber Optic Installation & Splicing, Maintenance & Restoration for CATV Applications, produced by Siecor Corp. Location: Keller, Texas. Call (800) 743-2671.

25-27 Advanced Broadband Applications Engineering Training, produced by General Instrument. A three-day training course which includes technical instruction on distribution systems, hybrid architectures, long-haul fiber optic transport systems, headend integration, network interfaces, ATM/Sonet/digital considerations and industry issues. Location: Baltimore, Md. Call (215) 830-5678 for details.

The issue: Set-tops

Congress wants to standardize them, and consumers often dislike them, yet cable systems are preparing to deploy millions of new analog and digital set-tops to act as gateways to new services. Yet there are myriad issues related to their deployment. What do you think about set-tops?

The questions:

1. Does your system presently use addressable set-top descramblers?

❑ Yes ❑ No ❑ Don't know

2. How old are the set-tops you presently use in your system, on average?

❑ Less than 1 year ❑ 1-3 years ❑ 4-7 years ❑ 7+ years

3. Is your system going to use the new "advanced analog" set-tops (such as GI's CFT2200 or S-A's 8600x)?

❑ Yes ❑ No ❑ Don't know

4. If so, what new features do you think are most important to consumers?

❑ Program guides ❑ On-screen messaging

❑ Virtual channels ❑ Other

5. Do you think Congress should standardize digital set-tops so that consumers can buy them at retail outlets?

❑ Yes ❑ No ❑ Don't know

6. Do you think a similar standard should apply to analog set-tops as well?

❑ Yes ❑ No ❑ Don't know

7. How familiar are you with the VESA and DAVIC organizations, which are both developing standards that will impact your system in the future?

❑ Very ❑ Somewhat ❑ Little ❑ Not at all

8. How soon do you expect to begin deploying new digital set-tops to subscribers on your system?

❑ Next 6 months ❑ Next year ❑ 1997 or later

9. Mitsubishi, NEC and Sony are just three new companies that expect to build set-tops for cable and telephone companies. Do you welcome new vendors to the market?

❑ Yes ❑ No ❑ Don't know

10. Do you think the addition of these companies will help reduce the cost of digital set-tops?

❑ Yes ❑ No ❑ Don't know

Your comments:

Fax us at:

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

*Every month, we'll pick one response from those we receive and award $50. See official rules below.

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Official rules: No survey response necessary. Enter by returning the completed survey via fax or mail to the locations indicated above, or print the words "CED Return Path" on a 3"x5" card and mail it along with your name, address, daytime phone number and signature. To be eligible for the drawing, entry forms must be received by 5 p.m. on August 31, 1995. CED is not responsible for lost or misdirected mail. One entry per person. Forms mutilated, illegible or not in compliance with these rules shall be considered ineligible in the sole discretion of the judges. Odds of winning depend on the number of entries received. A random drawing from eligible entries will be held on or about September 1, 1995. Winner will be required to provide his/her social security number and proof of identification and is solely responsible for all federal, state and local taxes incurred. Prize is not transferable to any other person. Sweepstakes participants agree to waive any and all claims of liability against CED magazine, Capital Cities Media Inc., Capital Cities/ABC Inc. and its affiliated and independent contractors for any injury or loss which may occur from participation in this sweepstakes or receipt of the prize. Winner consents to publication of his/her name for publicity purposes without further compensation. Participants must be 18 years of age or older. Employees of CED magazine, Capital Cities Media Inc., Capital Cities/ABC Inc. and its affiliated and subsidiary companies, and their respective employees, agents and independent contractors, and their immediate families are not eligible to participate. Void wherever prohibited, license required, restricted or taxed by law. Sweepstakes sponsors reserve the right to change or modify the sweepstakes rules while the sweepstakes is in progress. Participation in the sweepstakes constitutes acceptance of all sweepstakes rules.

RESULTS

The issue: Data communications

Cable networks can send data at speeds approaching 10 megabytes per second, easily outperforming even the fastest telephone-based modems. Equipment vendors say the market is ripe to be picked. But are cable operators excited about the market opportunity?

The results:

Spurred by a need to compete with telcos and egged on by local governments and schools, an overwhelming majority of cable operators who responded to the survey about data communications say they are interested in providing data services over the existing cable TV plant.

In spite of the high interest, however, a minority of those who sent in responses have actually tested or deployed modems, and fewer still have actively tried to market such services, probably because there is an absence of low-cost product. In fact, cable systems are searching for a low-cost unit, preferably under $200 each.

Interestingly, half of those surveyed said their systems are not prepared, technically, to deliver data services. While the survey didn't specifically ask why, it can be assumed that those systems are not two-way active or suffer from some noise/ingress in the return band.

So although the market has yet to be developed, a huge majority are both familiar with the Internet and subscribe to some type of online service, such as America Online, Prodigy, CompuServe or XPress.

1. How familiar are you with the concept of the Internet?

Somewhat	Very	Not at all
12%	**75%**	**12%**

2. Are you presently subscribing to a commercial online service such as Prodigy or America Online?

Yes	No	Don't know
62%	**38%**	**0%**

3. Does your system have any interest in providing data services over the cable network?

Yes	No	Don't know
88%	**0%**	**12%**

4. Has your system tested or deployed RF "cable modems" to allow this access to occur?

Yes	No	Don't know
38%	**50%**	**12%**

5. Does the local telco offer ISDN services in your franchise area?

Yes	No	Don't know
38%	**25%**	**38%**

6. Has your system been approached by local government, schools or anyone else to offer high-speed data communications?

Yes	No	Don't know
75%	**12%**	**12%**

7. Has your system actively tried to market such services to anyone?

Yes	No	Don't know
25%	**50%**	**25%**

8. Do you think datacom provision is a good way to compete with the local telco?

Yes	No	Don't know
75%	**0%**	**25%**

9. Do you think your system is technically capable of sending high-speed data?

Yes	No	Don't know
38%	**50%**	**12%**

10. How much would your system be willing to pay for cable modems?

Under $200	$200-$500	Over $500
25%	**25%**	**0%**

Comments:

"We have just begun to speak to schools regarding their information needs."
– Daria Robinson, Verto Cable, Scranton, Pa.

"I believe that as soon as the digital converters are available, it will include digital or modem inputs and the race will begin."
– Ed Sewferer, TCI, Des Moines, Iowa

"Question #10 can only be answered by knowing what type of customers and what speed is required."
– Brian Dunleavy, Garden State Cable, Cherry Hill, N.J.

Congratulations go out to Peter Hill of Verto Cable TV of Scranton, Pa., who won the May drawing for $50 simply by sending in his Return Path entry. To enter your name in a future drawing, simply fill out the survey on page 93 and send it in!

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Philo Taylor Farnsworth: TV pioneer

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

Who invented television? Actually, it depends on what you mean by "television." Paul Nipkow's 1884 application for a German patent is generally credited as the master television patent. However, the term "mosaic" applied to a visual image, akin to the modern "pixel," and the idea of scanning a scene in order to transmit images over a distance, were published for the first time in 1880, in separate scientific journals. Nipkow's patent showed how this could be done through the use of a perforated disc. Hardly television as we know it!

In 1922, a 16-year-old Utah farm boy, Philo Taylor Farnsworth, drew a diagram on a page of his pocket notebook, disclosing to his high school chemistry teacher an idea he had been nourishing since he read about the Nipkow Disc at age 13. The diagram he sketched in the notebook that day described an all-electronic television camera tube, which was later to become the image dissector.

Farnsworth was a voracious reader, hungry for information about science and invention, poring over anything he could find in the rural villages to which, as a farm boy, he had only occasional access. He absorbed an explanation of Einstein's Theory of Relativity so thoroughly that he was able to provide the high school chemistry class with the most clear and concise explanation the teacher had ever heard.

No moving parts

By 1926, the young Farnsworth had convinced sponsors to undertake the financing for his electronic television research in San Francisco. By July 2 of 1929, he had developed an all-electronic image dissector camera tube, electronic scanning generators and a CRT display tube. Farnsworth had the first-ever television system with absolutely no moving parts.

At one end of Farnsworth's image dissector tube, an optical image was focused on a photosensitive cathode. Electrons from the photocathode were electromagnetically focused onto an anode with a pinhole aperture in front of a photocell. The entire electron image was electrostatically scanned across the pinhole. Even with electron multiplier stages, the sensitivity was very low, since the intensity of the electron beam reaching the scanning orifice in the anode was determined only by the light intensity at the instant of scanning. Electrons emitted between scans could not be accumulated and held for discharge by the scanning beam, as they are in storage types such as the iconoscope and orthicon.

In April, 1930, Vladimir Zworykin, the Russian born RCA inventor, spent three days at Farnsworth's Green Street Laboratories in San Francisco. David Sarnoff, President of RCA, visited Green Street in May, 1931.

RCA and Farnsworth were at war. In 1935, in a famous and critical Patent Interference case, Zworykin's image iconoscope was found to infringe on Farnsworth's image dissector patent. Some believe Farnsworth's victory resulted from strategic errors by RCA in litigating the Zworykin patents. Nevertheless, it was clear that, without access to the Farnsworth patents, RCA could not fulfill Sarnoff's promise, made at the 1939 New York World's Fair, to "add radio sight to sound." In October 1939, RCA announced that, for the first time in its history, it had agreed to pay continuing royalties for the use of patents. Farnsworth's part in the development of television had come to a rewarding climax.

The dark side of invention

Philo Farnsworth shared with John Logie Baird not only the relentless pursuit of the dream of "Distant Vision," but also the frustrations of roller coaster financial support and technical failure. Although Baird had once said he saw "no hope for television by means of cathode ray bulbs," he later arranged to borrow the Farnsworth camera in a desperate attempt to match the EMI version of the iconoscope for the London tests in 1936. It failed, because of the insensitivity of the image dissector and a host of unrelated gremlins.

Baird married in 1931, at the age of 43, and had two children; but it was apparently not a close family. In 1926, Elma (Pem) and Philo Farnsworth were married, and later had four children, one of whom died of strep infection, barely two years old. The flyleaf on Elma Farnsworth's book, *Distant Vision,* describes it well as a "...lovingly crafted volume, written after 15 years of painstaking research." Few (if any) factual conflicts exist between her book and the heavily annotated scholarly account by Albert Abramson, in *The History of Television, 1880 to 1941* (McFarland & Company, Publishers, Jefferson N.C., and London), or his article in the *Journal of the Society of Motion Picture and Television Engineers,* November 1992. These and other sources used in preparing this column provide fascinating accounts of television's roots.

From boyhood, Farnsworth was dedicated to developing an all-electronic television system. Although the image dissector was not the answer, it was certainly a major step forward from Baird's unwieldy rotating discs and flying mirrors. Farnsworth is relatively unknown, and overshadowed by other pioneers in television history. But it is worth noting that in 1990, his statue was placed in one of the two Utah niches in the Statuary Hall at the U.S. Capital, through the tenacious efforts of the sixth grade students of the Ridgecrest Elementary School in Salt Lake City. "Those smart young people just would not give up," says Elma Farnsworth of their quest for recognition of Philo Farnsworth's considerable achievements.

The story of Vladimir Zworykin's pioneering contributions, including the kinescope and the image iconoscope, and his wisdom, dedication and experience, is for another time. CED

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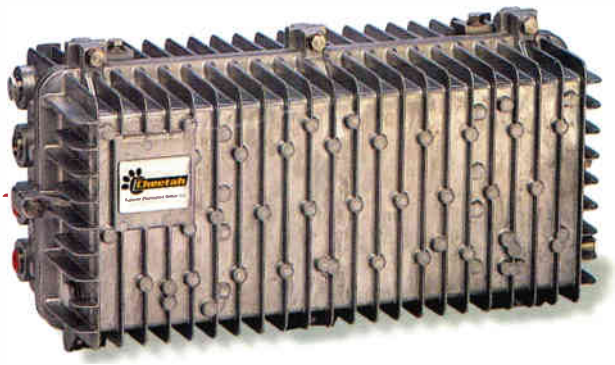

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