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Are smart cards safe enough for video security? Photo by Don Riley.

DEPARTMENTS

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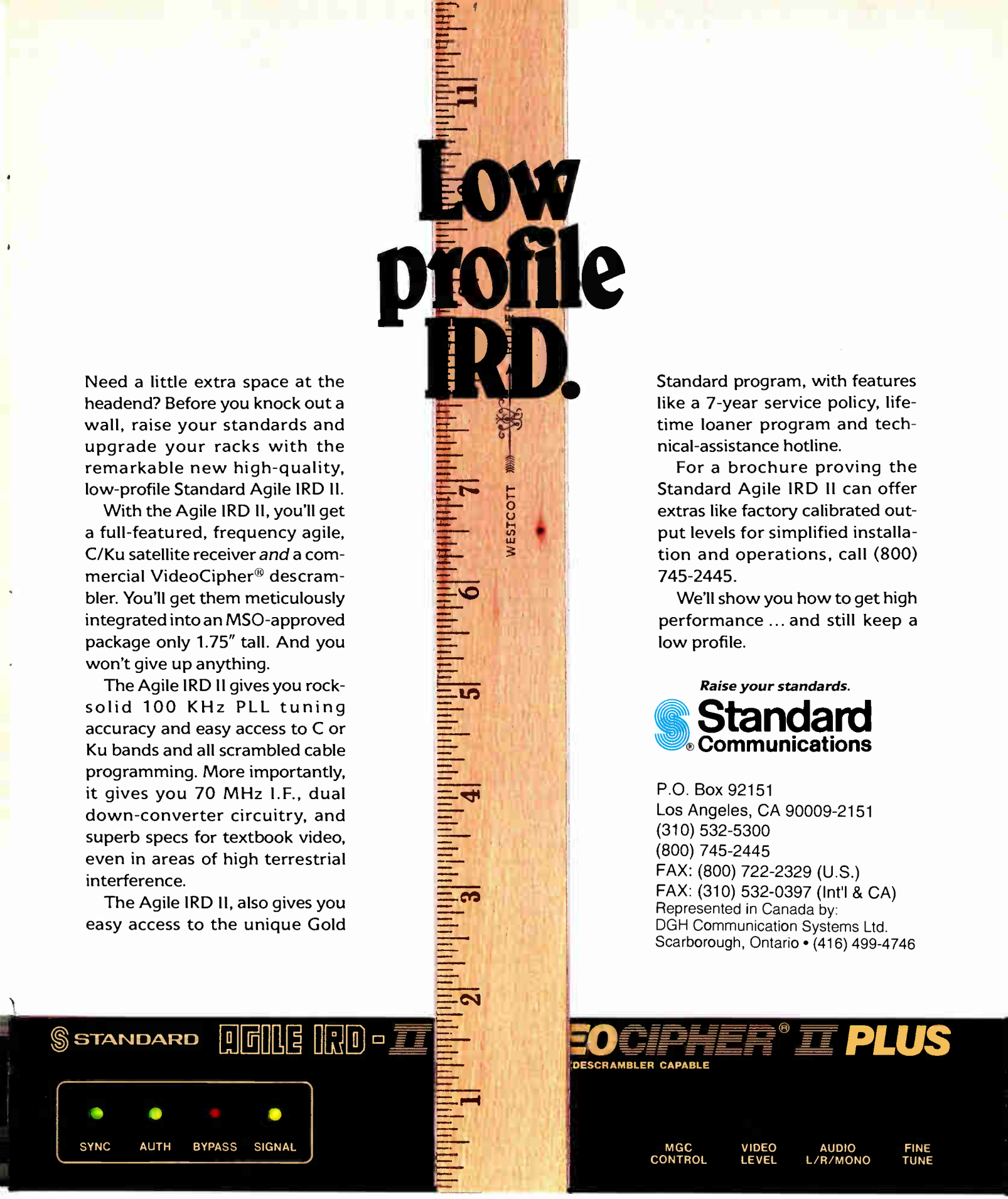

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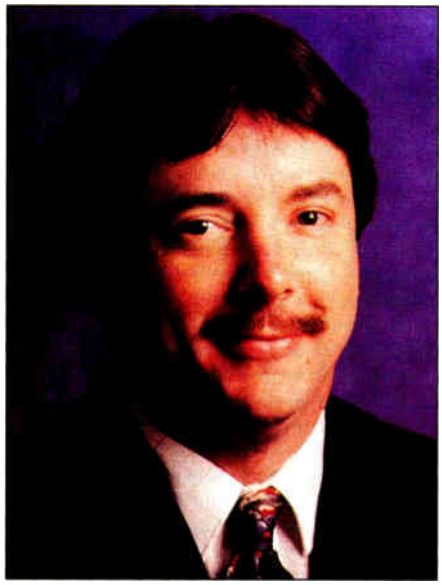
The compatibility fight: who suffers?

1993 is shaping up as the Year of Bloodletting for the cable industry.

After being re-regulated at the end of 1992, the industry has taken some well-publicized lumps in recent weeks over rates and the constitutionality of must-carry rules. Cable technologists now need to prepare for the Federal Communications Commission's rulings on compatibility with consumer electronics.

As outlined in a story that appears on page 47, the FCC already is in receipt of several sets of comments from cable operators and electronics manufacturers alike that attempt to outline methods in which cable systems can be made to be more compatible with TVs and VCRs (or vice versa). After reading the most substantive filings, I'm certain that the FCC will have to extract pain from both camps if cable's security methods are ever to be deemed "transparent" by cable consumers.



Boiled down, here are the arguments:

- TV manufacturers want the cable industry to either stop scrambling or adhere to a single scrambling standard so they can build TVs and VCRs that will work without any need for a set-top decoder. Absent that, they advocate the implementation of interdiction or broadband descrambling;
- The cable industry says scrambling is the cheapest, most effective and most flexible method to prohibit pirates from stealing service. It also wants a standard definition of the term "cable-ready" to include the EIA 563 decoder interface plug (MultiPort), better tuners in TVs to shield against direct pickup interference, and increased public education at the point of purchase.

Both cannot simultaneously win their arguments because they're incompatible. So, what choices does the FCC have?

First of all, the FCC won't do anything to obsolete the 280 million TVs and VCRs that already are in the market. Second, it legally cannot condone signal piracy (which it would be doing if it told operators to stop scrambling). It's doubtful the FCC would mandate a switch to interdiction because of the cost would be entirely borne by the cable industry–and broadband descrambling is little more than a good technical concept.

But the FCC could mandate a national scrambling scheme or require TV manufacturers to include a decoder plug in their TVs. It could call for the implementation of "smart cards" (see cover story, pg. 50). The FCC could force TV builders to use better tuners that reduce DPU, but the cable industry has yet to demonstrate the severity of that problem to the FCC. And the commissioners could force cable operators to provide set-tops with bypass switches or timers or other devices that return some TV and VCR features to consumers.

Predicting the outcome of this inquiry is tantamount to gambling–and experience has told me to stay away from the craps table. But cable operators should be aware that this legislation was brought about by a U.S. senator who is unhappy with his cable company, not his television. It would appear the consumer electronics manufacturers have at least the intent, if not the force, of the law on their side.

But the FCC should look beyond the rhetoric used by both sides and determine what is best for the majority of the cable customers. If it does that, it's my guess that both industries are likely to suffer at least a little.

Roger J. Brown

Roger Brown
Editor

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TCI accelerates rebuild program; to run fiber past 90% of subs

Tele-Communications Inc. announced during an elaborate video press conference last month that it plans to accelerate it's previously announced fiber/digital rebuild schedule to take place over the next four years. By the time the massive undertaking is completed, it will have cost the MSO $2 billion and will result in 90 percent of the operator's subscribers receiving video via fiber technology.

The upgrade to the "Infostructure Network," as TCI has dubbed it, will eventually be done in 250 cities across the U.S. In 1993 alone, the company plans to install 7,000 strand miles of fiber and spend about $750 million to do the upgrade.

TCI officials spent as much time talking about the political impact of the plan as the technical parameters. TCI President and CEO John Malone said this project "is a major step toward" President Clinton's proposal for a two-way information superhighway employing fiber optics and digital technologies. "TCI is proud to be a key player contributing to this national priority," he said.

The construction project has already begun in four of eight cities TCI has selected has regional "super hub" sites, including Pittsburgh, Miami, Denver and San Francisco, as well as several smaller systems scattered across the country. Construction in Chicago, Hartford, Salt Lake City and St. Louis is scheduled to begin later this year.

"This is probably the single largest construction initiative this company has ever undertaken," said Barry Marshall, TCI Cable Management Corp.'s executive VP and COO. He said the project will involve 1,000 contractors and 15 construction companies. "Now is a good time to be doing" the construction project because the costs of fiber and electronics has dropped significantly over the past year.

Along the way, TCI will be constructing 1 GHz networks that accommodate 200 MHz of compressed channels and return spectrum as well. Fiber will be tied into nodes that serve as few as 200 homes; therefore, as few as one or two RF amplifiers will be cascaded, a development which should radically improve reliability when compared to traditional all-coaxial tree-and-branch topologies.

With the introduction of that much fiber, TCI will be able to consolidate headends and decommission as many as 300 to 400 locations by the end of 1996, when the project is slated to be complted. "We plan to eliminate 75 headends in 1993 alone," said Marshall.

Malone said that as the market for switched, on-demand programming services develops, TCI would consider high-speed cell relay switching techniques such as Asynchronous Transfer Mode. Malone said he would prefer to work with a telco to share the cost of such a switch, but current regulations bar that type of arrangement.

TCI officials spent as much time talking about the political impact of the plan as the technical parameters.

Outside of the deployment of new technology and the political importance of creating new jobs, TCI executives predicted that the new services that will ride on this new network have the potential of changing Americans' lifestyles. J.C. Sparkman, TCI executive VP/executive officer said consumers could effectively work at home, benefit from interactive education services, participate in full-motion video games and use an inexpensive videophone.

Alluding to previous "blue-sky" announcements made by cable and other industries before, Malone said, "This type of announcement has been made before, but didn't happen. This time it is going to happen because the enabling technologies are available."

United Video offers platform for multimedia

In the spirit of "if we build it, they will come," United Video Satellite Group plans to create an open platform delivery mechanism designed to facilitate the transmission of interactive multimedia services to television viewers.

Along with United Video, cable set-top manufacturers Scientific-Atlanta, Pioneer and Zenith are participants in the project, along with Kaleida Labs, (the multimedia consortium set up by Apple Computer and IBM).

The purpose of the project is to provide a "pipeline" for programmers to deliver a wide array of interactive services. Roy Bliss, president of United Video Satellite Group, says the service will be open to all comers. "We're going to aggressively pursue outsiders–we won't bar anyone from participating."

To make the system accessible by consumers, cable set-tops, TVs and/or VCRs need to be outfitted with receptacles for external devices that will control access to the programming. Bliss says sidecar units for cable decoders are already available and he predicts that one day consumers will be able to visit a local electronics outlet to purchase an add-on "module." The cost of the module would vary from $40 to $100, depending on the device's capabilities.

Interestingly, the module will employ a "smart card" as its access control mechanism. Bliss said he predicts little chance for piracy because the service would be priced inexpensively. The use of smart cards may also allow United Video to monitor usage of the network via a "writable" card and offer promotions such as coupons or contests to program viewers.

Set-top manufacturers S-A, Pioneer and Zenith have already agreed to build receptacles for the add-on module, according to Bliss. He said the new service could be up and running soon. He also said he expects to see set-tops with receptacles as early as later this year and consumer modules in 1994. Although not yet a partner, Jerrold Communications has been approached by United Video as a potential participant.

United Video also looks forward to working with Kaleida Labs to use its ScriptX multimedia playback software for future digital set-top devices, said Bliss.

United Video is perhaps best known as a satellite-based distributor of superstations, The Prevue Guide and Trakker interactive services. It is also a partner in The Game Show Channel.

It appears this new multimedia platform would accommodate delivery of a wide range of interactive services, including perhaps a spin-off of "The Sega Channel," which is being developed a

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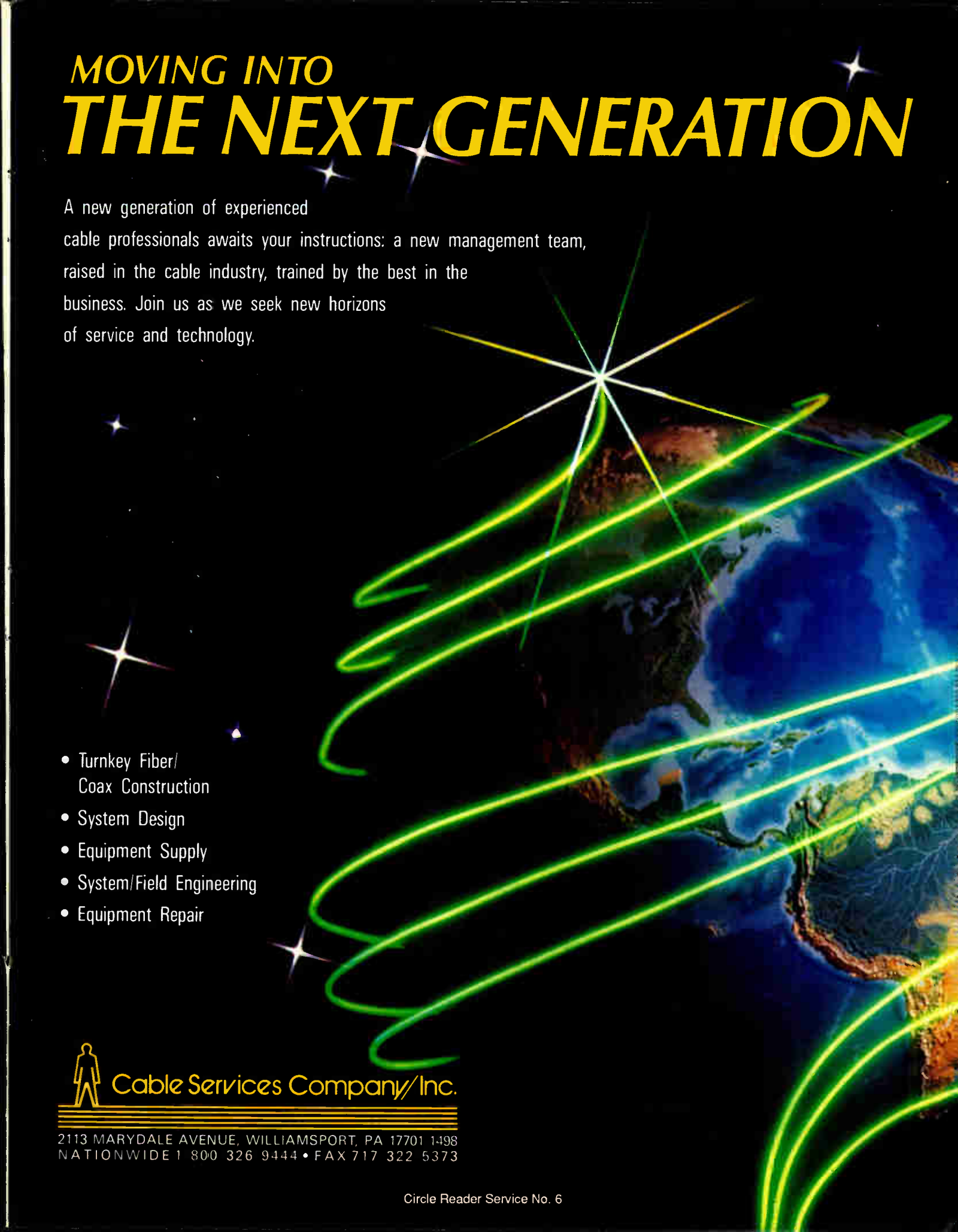

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marketed by the TCI/Time Warner joint venture that was also announced last month.

The new channel initially will be directly aimed at owners of Sega's Genesis game hardware. Subscribers of The Sega Channel will be provided with a special tuner/decoder cartridge that slides into the Genesis cartridge slot. A selection of games, previews, game tips, contests and promotions will be offered over the channel.

"This signals the beginning of an explosion of interactive programming for our developing broadband network," said Larry Romrell, senior vice president of TCI in a prepared statement.

Another potential user could be Viacom International, which announced last month that it had acquired software developer and publisher ICOM Simulations. ICOM publishes CD-ROM and cartridge-based video games.

According to Frank Biondi Jr., Viacom International's president and CEO, ICOM will become the research and development arm of Viacom New Media, which was created to develop, produce, distribute and market interactive software.

"Our acquisition of ICOM accelerates our timetable for introducing video games and strengthens our position as we develop software for the emerging multimedia market," Biondi said.

To facilitate the delivery of other interactive services, United Video plans to build and manage a national subscription service center designed to offer turnkey services, including uplink, satellite distribution through Prevue and integrated reporting, auditing and customer support systems.

While not a direct competitor to TCI's national digital uplink center that will be built in Denver, Bliss acknowledged that the two approaches have similarities. "We're on somewhat of a collision course with TCI," he said.

Time Warner buys ATM switch

Time Warner Cable has announced it has selected AT&T Network Systems' Asynchronous Transfer Mode switch to control voice, video and data switching in the Full Service Network planned for Orlando, Fla.

The AT&T GCNS-2000 ATM switch can be configured to deliver information at speeds up to 20 gigabits per second, according to Dave Schriftgiesser, director of data networking at AT&T Network Systems. With that much capacity, the size of Time Warner's initial subscriber base in the Full Service Network (10,000 homes) should pose no problems for the switch, he said.

For example, if 2,000 people simultaneously ordered movies, each of which takes up about 4 megabits of information, the demand on the switch would be 8 gigabits.

"That probably won't bother our switch at all," said Schriftgiesser. "Thousands of people demanding service from dozens of databases is not unusual for these switches at all."

However, as more subscribers are brought on line to the network in Orlando, additional switches may be necessary.

Schriftgiesser said the cost of the switch to Time Warner could vary between "several hundred thousand dollars to several million dollars," depending on how it was configured.

As of press time, Time Warner was preparing to announce the other vendors that were selected to provide hardware for the Full Service Network, but had not yet made the selections public.

CableLabs adds multimedia committee

Cable Television Laboratories has established a new subcommittee to help coordinate its highly publicized discussions with the computer industry. Called the Multimedia Subcommittee, it is chaired by Dave Fellows, senior vice president of engineering and technology with Continental Cablevision.

In addition, CableLabs has established a Telecommunications Subcommittee chaired by Mark Coblitz, vice president of strategic planning at Comcast Corp. This group will advise the CableLabs staff and member companies on research into personal communications services, competitive access and delivery of voice services via wire.

Both subcommittees are overseen by the Technical Advisory Committee, which is chaired by Alex Best, senior vice president of engineering at Cox Cable. Best said these changes were deemed necessary as cable operators explore new business opportunities. "These areas appear to be worthy of increased research and I anticipate that these subcommittees will remain busy for the foreseeable future," he said.

Continental plans fiber backbone

Continental Cablevision of New England will install a multi-state digital fiber optic backbone that encompasses three master headends and five hub sites and includes fiber route redundancy in key parts of the system.

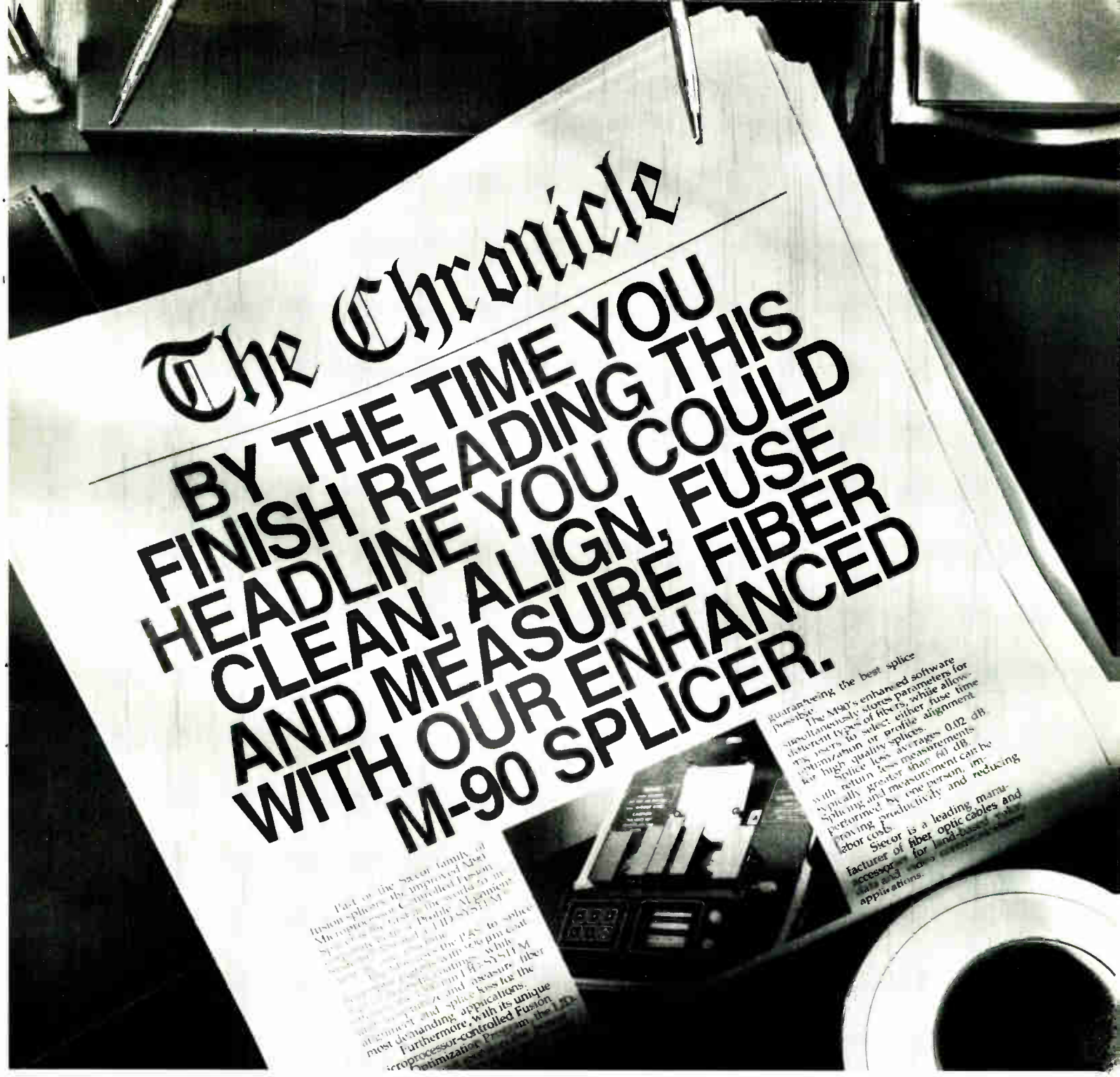
Continental will purchase the 16-channel digital hardware from American Lightwave Systems. The chosen system transmits video at an aggregate speed of 2.4 gigiabits per second with a maximum link loss of 30 dB. The deal is reportedly worth between $5 million and $6 million, according to ALS officials.

According to Bill Riley, director of network engineering for Continental in New England, the system will be built in three phases, beginning this year. Phase one will span 160 miles and cost about $1 million to link facilities located in Massachusetts, New Hampshire and Maine. Phases two and three will expand the number of locations and system channel capacities and may ultimately expand into Connecticut.

Jottings

Brooks Telecommunications Corp. has established a new company to assist cable MSOs and others enter the competitive access market. The new company is called Brooks Network Services and is headed up by Tom Gillett, who has held previous positions with CableLabs, GTE and the Bell System. BNS is already working with KBLCOM and FiberNet. Interested? Call Gillett at (314) 862-9544 . . . LSI Logic and Philips Consumer Electronics Co. announced they are jointly developing integrated chips for digital video compression applications. Both companies plan to develop products that adhere to international standards, such as MPEG. Digital TV products are among the items being planned for development . . . Broadband Technologies says it has developed a system where telephone companies can offer 1,500 interactive video channels for less than $500 per customer. The product will give telcos a "significant advantage over cable companies in the race to build the country's information superhighway," according to a press release.

Compiled by Roger Brown



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Ken New

New knows: SCTE in Canada

Maybe it was all the chalk thrown at him, and the knuckle-rappings, and being carried out of class by his ear while attending an all-boys school in England that made Ken New have such a significant sense of purpose. Certainly, something gelled to inspire New's creation of Ontario, Canada-based Angstrom Communications, of which he's a co-owner. And certainly something spurred his personal commitment to the Canadian SCTE, where he's both the national president and president of the Ontario group.

New's personal drive was evident even from his first steps into the cable television industry. As an electronics engineering technology student at Mohawk College, New applied for a co-op job with a division of McLean-Hunter Cable TV. He never got a call–so he called them, and arranged for an interview. "I just did the next obvious thing to get it going," New recalls.

He got the job with Communications Engineering Services, a consulting firm owned by the Canadian MSO. He started as a staff technologist, working on headend maintenance and repair, TVRO applications and system sweeps.

Then, roughly 10 years ago, an opening came up in one of McLean Hunter's northern Canadian systems. "At the time, the system was undergoing a massive rebuild. It had been built in the mid-1950s, and it needed a lot of work," New recalls.

He applied for and got the job, knowing full well (and expressing up front) that he wanted the job for the experience. "I wanted to get a feel for system life. I was looking at it not only as a challenge, but as a stepping stone," he admits.

The next three years represented a whirlwind of challenges and responsibilities for New. He describes his involvement with the McLean-Hunter rebuild as his single most significant engineering adventure. "I was responsible for everything–installation, contracting, construction, maintenance and service," New says.

Complete immersion

Because New's cable background had previously included mostly headend-specific applications, exposure to the full spectrum of issues was a real eye-opener. "I probably spent a good part of the first year just chasing my own tail," New laughs. But, he adds, probably the most valuable lesson learned at McLean Hunter was the company's budgeting process. "I can't even begin to describe how much that process helps me now. As much as I loathed it then, it organized my whole life," New says.

When the rebuild from 200 MHz to 400 MHz began winding down, New looked to the horizon for another stepping stone. What he found was Cabletel, a Canadian equipment distribution firm. Soon after, he joined it in a technical support role, providing pre- and post-sales support and technical training.

At Cabletel, part of New's responsibilities was to travel Canada from coast to coast–which is much different from traveling the U.S. from coast to coast, New says, given the massiveness of the country and the wide population spread. "Imagine taking the entire population of California and dispersing it throughout the U.S. That's what Canada is like," he explains.

New quickly learned that technical support roles aren't really what make distribution companies tick, and he decided to sidestep into fiber optic sales for the company. "I spent a lot of time selling fiber technologies into non-cable businesses, like telephone companies, power companies and LANs." Because he was wary of commissions, New negotiated his own, straight-salary compensation plan.

New's inherent business savvy soon created a desire to take the company's fiber opportunities in other directions. Cabletel execs didn't agree with his views, so in 1991, he and a colleague broke away from the company and gave birth to Angstrom Communications. Interestingly, the name Angstrom (which is, appropriately, a measurement for the wavelength of light) was New's fifth choice. Originally, New had his sites on the name "Quantum," but legal advisors cautioned him to select another name.

The decision to start Angstrom wasn't without some sacrifice. The New family sold their home in order to finance the venture. "Starting a new company is a big risk," New says. "It's a real rough thing to do to a family."

So far, though, things have progressed rapidly for Angstrom. As a fledgling fiber optics distribution firm serving Canada, the company has picked up a plethora of equipment lines; the News were able to move into another home last fall.

And, last November, New was selected as president of the national Canadian SCTE. The national group was formed, New explains, out of a desire to participate in international SCTE events. "The Canadian SCTE, prior to the formation of the national group, was four distinct and separate entities: the East, West, Ontario and Quebec groups," New explains. He is also third-term president of the Ontario group.

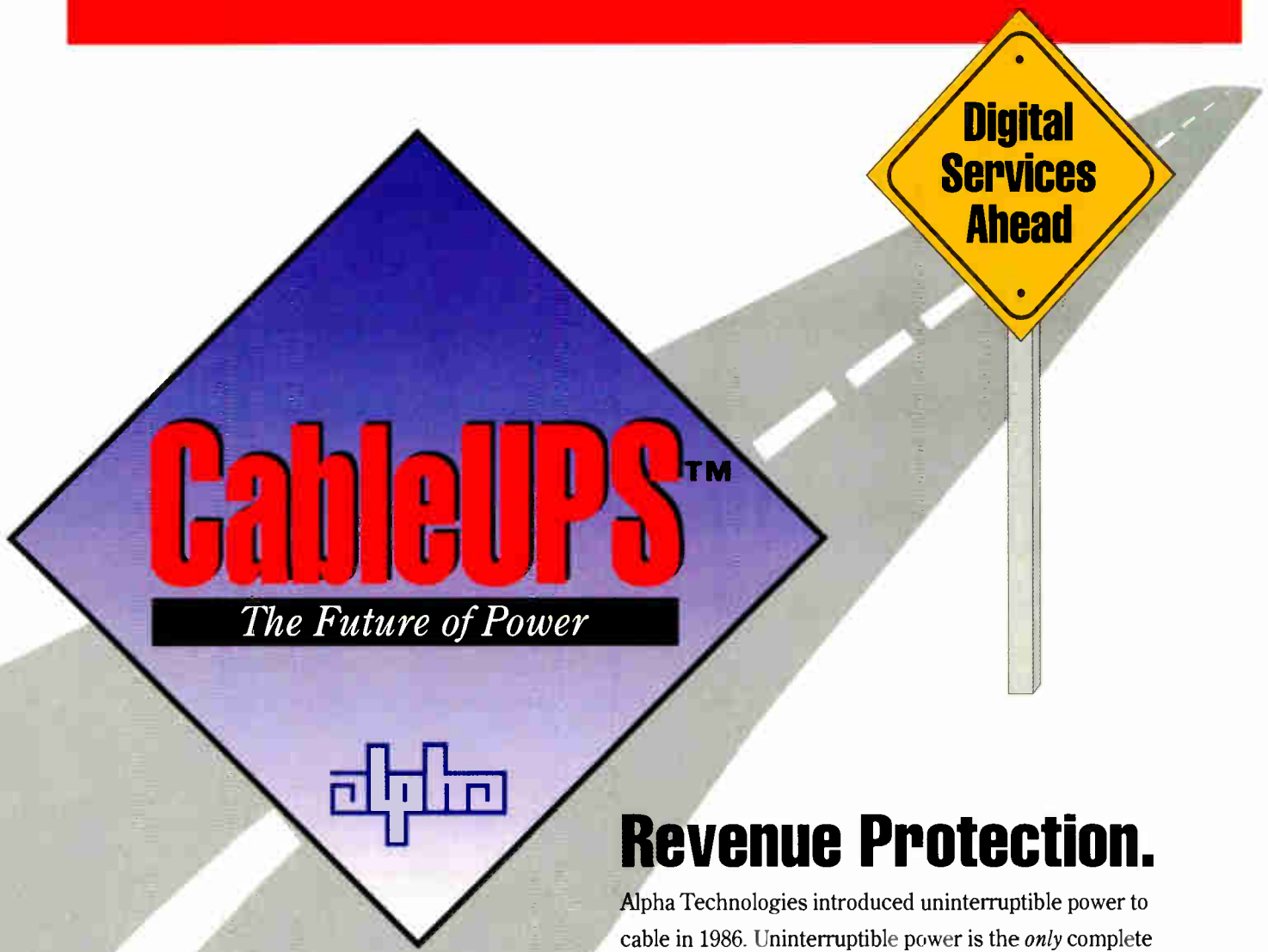
When asked of his goals as president of the Canadian national SCTE, New cites both short- and long-term endeavors. In the short term, he says, he'd like to finalize the legal work associated with establishing the national group, do an awareness drive to gain national members and fortify an accreditation program much like the U.S. SCTE.

"Long term, though, we'd like to get the training going and to chapterize," New says. "MSOs don't want to fly two of their guys halfway across the country to attend an SCTE meeting."

New's real allegiance, though, is to his wife, Karin and their two children, Ryan (8) and Tonya (6). "Why do you do it? You do it for the family," New says. Karin, he adds, not only put him through college, but stood by him during his career moves and decision to start Angstrom. "They're my greatest assets," New says of his family.

And when he's not busy with Angstrom or the SCTE, New says his number-one hobby is home renovations. "My favorite shows are Home Improvement, Home Time and This Old House," New admits. One summer, in fact, he spent his entire vacation digging out the family pool during the hottest summer Canada had seen in years . . .which makes one wonder if perhaps New fielded one too many pieces of chalk to the head at that English boys school. CED

By Leslie Ellis



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Put your money where your mouth is: smart cards

As I prepare to write this article I find that I have to take a deep breath and steel myself for what will no doubt be a barrage of comments from readers. Some of them will be of the "here we go again" variety and others will likely attack my veracity or my intelligence–or perhaps both. But this column is highly relevant to CED's cover story (pg. 50).

Smart cards are about many things, but in this particular context they relate to security tools for the cable television industry. Before we can talk rationally about smart cards and their efficacy in our environment, however, let's talk first about security and where we, as an industry, stand.

According to the Coalition Opposing Signal Theft, the cable industry loses approximately $5 billion per year to theft of cable service. This adds an illuminating hue to the issue of protecting one's services. With $5 billion, one could do many nice things on a cable system, and perhaps even support a new program service or two.

But the important point here is the evolution of cable operator attitudes regarding signal security. Some operators, for example, choose not to deal with security. They look at the level of loss on a given system, compare it against the cost of programs to mitigate or lessen that loss, and then make decisions about whether the program costs more than the disease. I do not think this is the correct approach, but relent to its understandability.

By Wendell Bailey, VP of Science and Technology, NCTA

The three elements of security

Remember, security has three elements: transparency, security and economy. It is quite easy to make a transparent system that is economic, but such a system will not be very secure. It is just as easy to make a system that is highly secure and economic, but it won't be transparent. And it goes without saying (but I'll say it anyway) that one can make a highly secure system that is utterly transparent–but no one could afford it.

Today, we have systems that are relatively economic and very transparent, with a modest level of security. Sure, it's possible to defeat these security systems, and we spend what effort and money we can to find and prosecute those who defeat them. But for most customers, today's signal security measures quite simply provide a deterrence to temptation.

Enter smart cards. It has been proposed by many intelligent people that smart cards are a useful solution to cable television signal security. By this, they mean that the descrambling or decryption techniques would be built into boxes and the intelligence needed to operate the security system would be contained in a so-called "smart card." If the security system were breached, the cable operator could have a new smart card designed and could simply recall all the old smart cards–or change the security system so that only a new smart card would activate it.

There are many arguments about why this is an efficient and useful approach. But lest my small and meek voice lose out to the more erudite opinions and arguments contained within these pages, let me say that I am not at all anxious to see a smart card world. My fundamental problem with smart cards comes down to this: I am not willing to bet the financial health of the industry on the effective implementation of a security system that has, as its primary component, a portable device such as the smart card. Further, I am less than inclined to bet the financial health of the industry on a device that is primarily owned by the subscriber.

For all its flaws, the one major component of all existing signal security systems that gives me confidence is that in the case of an ineffective level of security–in which the revenue losses would exceed the cost to provide improved security–the operator has the option to reclaim the old security system and replace it with a new one. If, on the other hand, the consumer owns any part of the security system, a cable operator loses the option of taking back that part, if that part is indeed the weak link.

Opponents say that, when correctly designed, most of the intelligence and descrambling capabilities are on the card itself. I find that to be an even less enticing idea. If cards are portable and can be slipped into the wallet or pocket, I see no particular reason why they can't be counterfeited.

The people who support smart cards constantly point to places in Europe where smart cards have been used with success to protect the money at money fountains such as automatic teller machines.

To that I say this: it's hard to defeat an ATM in any case, because it's difficult in the cold light of day and under the supervision of a surveillance camera to whip out a soldering iron, get the cover off the ATM and have your way with it.

In a smart card world, things are much different. It's much easier to close the drapes in the living room and take apart any mechanism that the cable operator has left inside. We come down to this fundamental point: the comments put forth by the learned people quoted within this magazine prove to me once again that some of them are much, much smarter than I. They are educated and experienced and well-versed in these matters, and I am willing to concede that they know a lot more about smart card and the relevant technologies than do I.

And they may also be successful in convincing me that smart card signal security can be handled in a way that at least is equal to anything in use today. What they cannot guarantee me, however, is that someone smarter (or luckier, or more larcenous) than they doesn't find a way to circumvent the protection offered by the smart card–particularly after 40 or 50 or 60 or 90 million of these devices have found their way into American homes.

Once again, we come down to a simple bet: Are these smart card aficionados not only smart enough but lucky enough to have their concept prove in against the long haul? Or should I, as a pragmatic person, retain the ability to recall any and all pieces of my security system if I deem it necessary, and replace them with something that will protect me for a bit longer? Therein lies the question.... CED

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Winning the race?

Hardly a day goes by without someone asking me questions similar to: "Who is winning the race with fiber?" Or, "Is the CATV industry going to be around in 5 years now that the telcos are serious about providing video dialtone?"

Let's face it, there has been a significant amount of media attention in recent months surrounding this very issue. Technology announcements and trials with ADSL and HDSL that will allow "broadband" services on twisted pair, telco RFPs for hybrid fiber and coaxial architectures for potential overbuild of the CATV plant, the Bell-Atlantic lawsuit, and speculation on even more powerful future technologies such as ADSL-2 have all added fuel to the fire. So, what's the answer? Who is winning the race?

Strategy has changed

When the CATV industry first began the deployment of fiber several years ago, there was very little thought being given to its strategic placement. In fact, the predominant application for the deployment of fiber was simply a reduction of amplifier cascades with the resulting improvement in picture quality and reliability. In the beginning, fiber deployment was a comparatively expensive proposition, and as such, it took a special team of forward-thinking technical, financial and operations associates to deploy the technology when the only perceived benefits at the time were picture quality and reliability. In general, there were no other potentially significant new revenue opportunities. That has now changed.

Today, having deployed over 24,000 route miles of fiber through the end of 1992[1], the CATV industry is now enjoying fiber's other benefits. Laser linearity has improved significantly over the years, allowing increased flexibility in routing and deployment. As the industry's volume levels have increased, and as the manufacturers' laser yields have improved, optical link costs have dropped significantly, to the point that it rarely makes sense anymore to even attempt a rebuild without fiber optics.

In fact, Kagan[2] projects a 121 percent increase in the number of fiber route miles to be deployed by the CATV industry in 1993 (21.4k miles) vs. last year's 10,580 miles. He further predicts an increase of 221 percent in the number of fiber (glass) miles to be deployed, indicating a strong industry trend to increase the number of fibers deployed to every node.

Different telco approaches

The telephony industry also continues to deploy enormous amounts of fiber. Early deployment was simply to interconnect central offices (COs). However, the telcos are continuing to deploy fiber even deeper into their networks through the use of optical loop carrier technology. Using optical technology and digital multiplexing, fiber is deployed beyond the central office to a remote terminal that may serve around 2,000 homes (sound familiar?). In addition, the telcos have an installed base of switching technology that is unmatched anywhere else in the world.

There is no doubt that most of the telcos are taking an aggressive position when it comes to getting into the video business, albeit by very different means. Southwestern Bell recently decided to get into the business in Bell Atlantic's territory through the purchase of some CATV properties on the outskirts of Washington D.C. One could speculate that this could possibly be an indictment that twisted pair into the home simply will not support broadband telecommunications needs in the future. Perhaps it felt that the least expensive (or quickest) way to get access to this broadband infrastructure was to simply buy an existing CATV property.

Ameritech, on the other hand, which has been experimenting with ADSL technology, has indicated it is now looking forward instead to ADSL-2, because the current ADSL technology, at only 1.5 Mb/s into the home on twisted pair, simply won't suit its needs. ADSL-2, which is currently under development but years away from commercial realization/penetration, promises up to 6 Mb/s into the home over twisted pair for significant distances. This would potentially allow for four switched but simultaneous movie channels into the home as opposed to ADSL's single switched channel. The provision of at least four channels into the home is seen as important so that additional outlets and VCRs could simultaneously and independently use the service. ADSL's current cost projections of $600/subscriber (at only 1.5 Mb/s), however, does not on the surface seem to bode well for the cost of implementation for ADSL-2.

Twisted pair just won't cut it

Each of these potential solutions to telco delivery of video to the home, as different as they may seem, all point toward the ultimate realization that technology, no matter how advanced it becomes, will never be able to cram as much analog and digital information on a twisted pair as you can place on a coaxial cable–given the same distance. But does any of this mean that either the CATV or the telco industries are actually winning the race?

The answer ultimately depends on how the parameters of the race are defined. The CATV industry certainly has a head-start in the deployment of a true broadband hybrid fiber/coaxial pipe into every home in the United States–the so-called "last mile." The telco industry, on the other hand, even though limited to a narrow-band solution for the last mile, certainly has a head-start in the deployment of switching technology, a "national" (as opposed to regional) fiber-optic distribution infrastructure, and the potential for using that technology for on-demand services and interactivity. But note that neither industry has exclusive rights to either technology. All each industry has, in essence, is a head-start with the deployment of some (perhaps) mutually beneficial technologies. And this, perhaps, might help us to better understand the true essence of the race. CED

References

1. Cable TV Technology, Paul Kagan Associates, Inc., No. 189, March 19, 1993.
2. Ibid.

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

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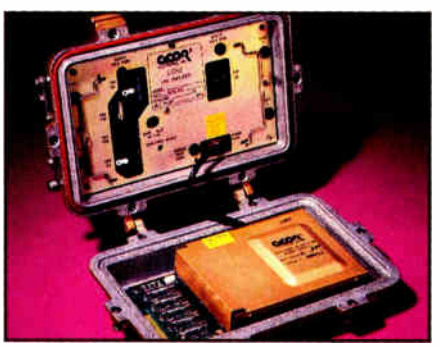

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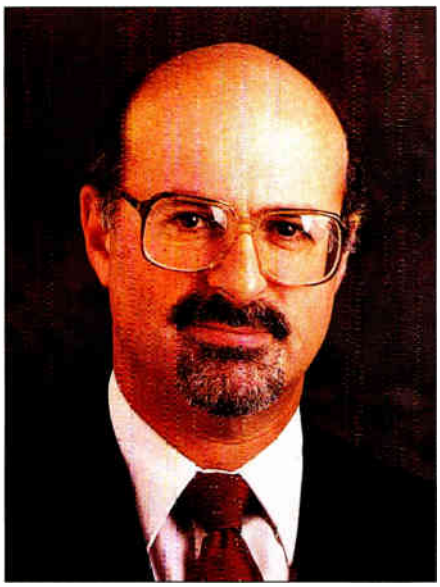

Consumer electronics/cable

The 1992 Cable Act requires the FCC to investigate the compatibility between cable systems and consumer electronics products, prepare a report to Congress, and adopt regulations to make cable systems and consumer electronics more friendly to each other. But since the two industries aren't especially friendly, don't expect much improvement in equipment friendliness.

Congressmen and Senators are consumers too—they buy TV sets and VCRs, and they subscribe to cable. One Senator bought a new TV set in 1991—one with lots of nice features—hooked it up to his cable system, and found that he lost the use of many of the features. So he decided to fix the problem by adding language to the cable legislation that was working its way through the Congress.

The FCC must consider the following functions: watching a program on one channel while simultaneously taping a program on another channel; taping two consecutive programs that appear on different channels; and using advanced picture and display features such as picture-in-picture. Cable systems will be prohibited from interfering with these functions, but only if security techniques such as scrambling or interdiction are not compromised. The law also requires the FCC to define technical specifications for the terms "cable compatible" and "cable ready."

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

TV and convertor advanced features

Once you hook up a cable convertor/descrambler, with its output on channel 3 or 4, to a TV set with "advanced features," many of the advanced features are lost. While there are non-scrambling techniques for signal security, such as traps or interdiction, it is generally agreed that addressable scrambling is the best approach for most cable systems.

Convertors are also needed, in some cases, to combat direct pickup interference. Today's TV sets and VCRs are notoriously susceptible to interference from strong TV signals that leak in through the case and chassis. For example, a channel 7 off-air signal interferes with the channel 7 programming that is delivered by the cable system. This interference occurs within the TV set, not within the cable system or the cable convertor. So a cable operator supplies a convertor that delivers channel 7 programming (and all other programming) on channel 3 or 4, whichever is vacant in that city.

Cable equipment manufacturers have just begun to supply convertors that restore some of the features that have been taken away. You will soon see convertors with an RF bypass, for example. When watching unscrambled programming, the cable signal bypasses the convertor and the entire broadband signal goes directly into the TV's F-connector. (I've been doing this for years, with a splitter in front of the converter/descrambler and an A/B switch following. Haven't you?) And if you hook this up properly, you can watch an unscrambled channel while at the same time recording a descrambled premium channel.

You will also see convertor/descramblers with two tuners and two descramblers. This will allow you to simultaneously watch and record two premium channels. It will also drive the picture-in-picture function of TV sets having that capability.

Finally, you will see convertors with on-screen displays and programmable timers that change channels to permit recording of programs on different channels. Just leave your VCR tuned to channel 3.

The MultiPort

A better solution is to use the tuner in the TV receiver, rather than the tuner in the convertor/descrambler. The external box would contain just a descrambler. The broadband signal enters the TV set and the selected channel is either displayed, or if scrambled, it is sent out to the descrambler for processing and then returned to be displayed. In this way, all of the TV set's functions are preserved. This approach is known as the "MultiPort," an approach the industry has tried. But special TV sets are needed for it to work. These TV sets need a special connector, called the ANSI/EIA 563 Decoder Interface Connector, on the back.

Technically, this approach works pretty well. But neither the cable equipment suppliers nor the TV receiver manufacturers nor the cable industry's marketing executives were crazy about it. Only the cable industry engineers liked it. So it failed in the marketplace.

(Actually, it didn't work perfectly. I have one of the special TVs, and I had a MultiPort descrambler in my home for about six months. The special cable between the TV set and the MultiPort descrambler kept falling out of the connector, because it is held in by friction rather than screws. And every time I turned on my TV set, I got an unintelligible picture, because the TV set tuned to the "nomimal" (off-air) channel frequency but my cable system uses the HRC channel plan. The engineers who wrote the ANSI/EIA 563 standard didn't know how some TV sets decide which channel plan to use.)

Meanwhile, industry engineers are working to improve the ANSI/EIA 563 standard, because the cable industry hopes to get the FCC to adopt a definition of "cable compatible" receiver that makes the ANSI/EIA 563 connector a mandatory feature of most TV sets. The cable industry also wants the FCC to require TV sets to employ double conversion tuners which will provide improved image rejection and adjacent channel interference rejection, and improved shielding against direct pickup interference.

What's next

The FCC must submit a report to Congress by this October and must adopt rules by next April. The cable industry and TV set engineers will try to work out compromises, but in the past, successful compromises between the two industries have been difficult to achieve. Meanwhile, the trend to digital video compression has confused the subject, because it is too early to determine how the new digital video decoders will interface with TV sets and VCRs. So–tune in next year. That is, if your TV still tunes in to this channel. CED

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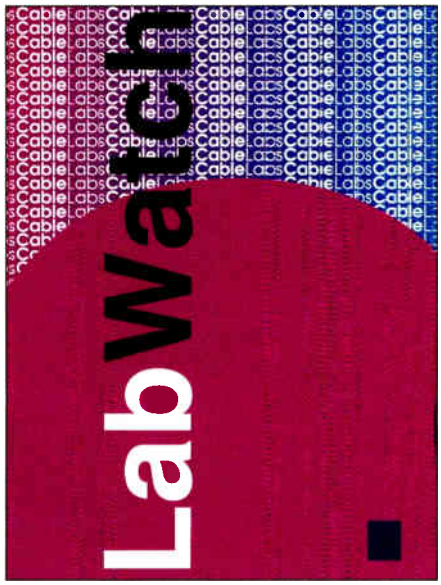


Bandwidth management: a new role for cable operators

Cable companies have had tremendous success as packagers and carriers of video entertainment. But do more victories lie ahead as cable moves into new realms of point-to-point, digital communications services?

Nobody knows for sure. But CableLabs' Stephen Dukes believes he has another important tool for the cable operator to use in managing bandwidth.

To Dukes, CableLabs' vice president for advanced network development, successful bandwidth management will involve such steps as increasing upstream bandwidth for interactive services, adopting digital compression, defining digital datastream protocols, migrating fiber further down into the network, and dynamically allocating bandwidth to digital services only when it's needed.

New digital services are waiting in line to get on the cable pipeline, noted Dukes, including personal communications services (PCS), digital ad insertion and multimedia entertainment and interactive services.

What is multimedia?

Multimedia means integration of diverse data types—video, audio, graphics, animation, text—on demand. Some planned multimedia services, such as education at home, working at home via cable commuting or job-skill enhancement via distance learning, could have a big-bang impact on a still-queasy U.S. economy. Other multimedia offerings, like cableshopping and interactive games, could be mammoth revenue producers for the cable industry.

A key to future success, said Dukes, is to build an infrastructure that can flexibly accommodate new digital services while preserving cable's role as the low-cost provider of video entertainment.

A first prerequisite of successful bandwidth management, said Dukes, is implementing a robust return path with increased bandwidth. Although most digital services will be highly asymmetric, with downstream data flows far exceeding upstream flows, reliable two-way signaling is a must for control and synchronization purposes, he noted.

Two roadways viewed

CableLabs is defining two roadways for data transmission, Dukes pointed out. One is a 19.2-kbps downstream-only channel which is already being put to use by designers of first-generation on-screen interactive program guides. The second is a variable bit-rate, two-way path accommodating speeds of 10 Mbps and beyond and compatible with the Moving Picture Experts Group's MPEG 2 standard, which is nearing formal definition.

An even 10 Mbps is a convenient number to rally around, said Dukes, because Digital Equipment Corp. already has equipment running at that rate and chip-makers are committed to making 10 Mbps MPEG 2 chips. Dukes even alludes to (unnamed) future applications running at multiples of 10 Mbps with multiple 10 Mbps data channels chained together.

In order to support reliable, two-way data transport, Dukes sees cable companies migrating fiber optics down to nodes passing 200 to 500 homes each. Bringing fiber to nodes serving 200 homes will mean that active electronic components like amplifiers and line extenders can be removed from the coaxial cable drop to the home, transforming that drop into a "passive" link in the network. However, the passive coaxial design is largely a function of density at this point, with high density serving areas being viable today.

Downstream analog and digital signals, probably traveling on separate fiber strands from the headend to the fiber hub or fiber node, would probably be combined at the fiber hub or fiber node for transport over this passive coaxial tree-branch network to the home.

Network Interface Unit

At the home, an intelligent network interface unit (NIU) will "serve as the line of demarcation between the network and the home," Dukes said. It will contain a low-noise amplifier to boost the incoming and outgoing signals, along with digital decompression chips, encryption/decryption and other functionality.

Upstream signaling will be managed on a contention basis, with the NIU polling the potential upstream channels to find one not being used by a neighbor. Finding one, it will set up a pathway only as large as a given application needs, and only for a particular communication session's duration. Coping with multimedia sessions' long holding times—which may be many times longer than the typical two-minute phone call—will be a network designer's challenge, he said.

This dynamic bandwidth allocation, Dukes pointed out, is appropriate for applications with large bandwidth demands, such as multimedia. In Dukes' scheme of things, some digitally compressed applications, such as multichannel pay-per-view movies, would probably be assigned to fixed channel allocations.

Dynamic bandwidth allocation is appropriate for applications with large bandwidth demands.

"As you migrate down to lower and lower numbers of homes passed per fiber node, the problem of dynamic allocation of bandwidth becomes easier to implement," Dukes said.

DQ-RAP

CableLabs researchers are studying Distributed Queuing Random Access Protocol (DQ-RAP) as a

By the CableLabs staff

protocol that could provide the physical layer functionality needed for managing dynamic bandwidth allocation, including variable bit-rate and constant bit-rate upstream signaling, Dukes said. DQ-RAP is a variant of the IEEE's 802.6 wide area networking protocol, adapted for the kind of contention found in a cable system's tree-branch coaxial network.

It is still a bit premature, Dukes added, to say what role various protocols such as DQ-RAP, SONET (synchronous optical network) and ATM (asynchronous transfer mode) will have in future cable networks. CableLabs and cable companies are working with computer companies and others to design a network optimized for transport of multimedia, PCS and other applications. Migration of ATM-like functionality will largely be traffic dependent and focus on traffic migration from constant bit-rate, fixed bandwidth to variable bit-rate, bursty transactions.

For instance, one way of enhancing this network's performance and reliability will be to build in "self-healing" features whereby the network can automatically sense failures in fiber communications links and switch to alternate pathways.

Another decision-making arena in bandwidth management is the question of just how much coaxial cable bandwidth is enough, with different MSOs viewing 450 MHz, 550 MHz, 750 MHz and 1 GHz as all the bandwidth they need.

Even at 550 MHz, Dukes noted, a mixture of analog and compressed digital channels numbering well over 400 can be supported. With nodes serving 200 homes passed, "I can provide better than one-to-one capacity, so in effect I have pseudo-video on demand without any switching functionality," Dukes said.

Table 1
Next-generation applications

- Multimedia
- Multichannel pay-per-view
- Digital advertisement insertion
- Advanced program guide
- Personal Communications Services

Source: CableLabs

Who needs switching?

With such capacity, and given currently established consumer demand for broadcast channels and hit movies, such a system "can probably meet more than 95 percent of consumer demand. If I can meet 95 percent of the demand by doing compression, we may not need to incur the expense of broadband switching," said Dukes.

This kind of logic leads Dukes to conclude that cable—wielding such a hybrid architecture, part multicast and part point-to-point—can take on all comers during the 1990s, and probably beyond.

This article was written especially for CED *by the staff of Cable Television Laboratories Inc., the MSO-funded research consortium based in Boulder, Colo.* CED

Optimizing optical splice loss: Just how low can you go?

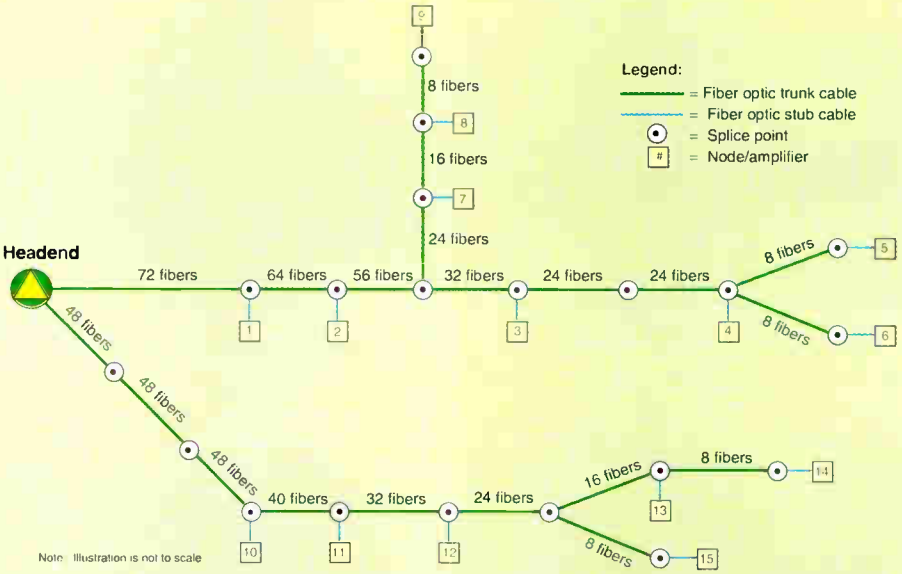
As optical fiber is deployed further in the CATV systems, the number of splices and splice points are increasing. Today, several architectures exist for placing optical fiber cable in the trunk and feeder environments. Until recently, the most common was a straightforward architecture using low fiber-count cables from the headend to a few nodes.

A fiber lead from each of the transmitters was fusion spliced directly to the outside plant (OSP) cable. The fiber count of the trunk cable would taper as each node was supplied. A pigtail lead from the node was then fusion spliced to the cable to complete the system.

To manage the fibers and couplers required at today's headend, operators are using fiber optic patch panels equipped with new, low-loss and extremely low reflectance (50 dB return loss or better) physical contact-type connectors that allow ease of testing, growth, reconfiguration, upgrades and manageability.

By Robert Hilton, Implementation Supervisor, and Michael Ott, Project Supervisor, Stecor Corporation.

Figure 1:
Typical CATV cable plant



High fiber counts

A system on the leading edge of the industry will have fiber counts in the hundreds entering the headend, couplers splitting the outputs of more powerful transmitters, dozens of field splice points

Figure 2:
Typical headend
(with patch panels)

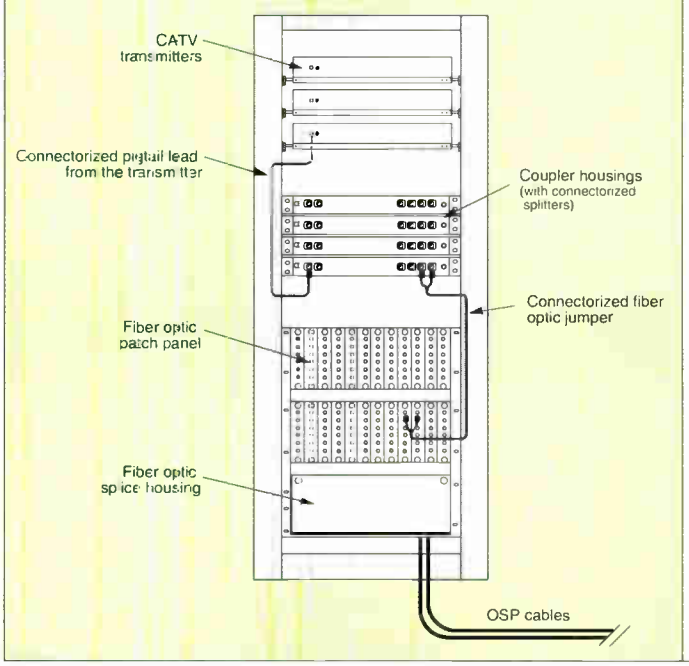
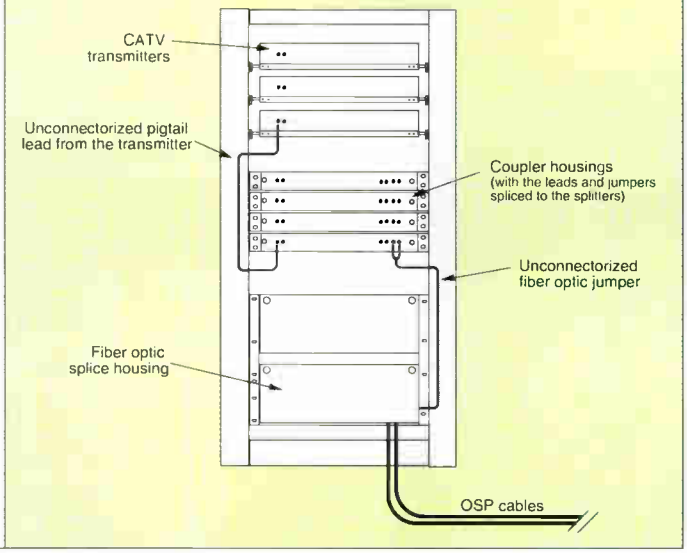


Figure 3:
Typical headend
(Transmitters directly spliced without patch panels)



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and nodes, and thousands of splices. (See Figures 1 through 3 that depict a typical CATV plant).

The CATV industry has always been concerned with the optical power loss and return loss of field splices. The splicing equipment available to the market has greatly improved over the last several years and can now achieve a very low average splice loss and reflectance. This article discusses a reasonable goal for splice losses and how to properly verify the passive optical system performance.

Specifying splices

Splicing is performed in three areas of the cable TV network:

- In the headend,
- At receiver nodes, and
- At field points.

In the headend, outdoor cables are fusion spliced directly to the electronics leads or to pigtails for interconnection in patch panels.

At receiver nodes, the fiber optic trunk cable is transitioned to coax cables via the electro-optic receiver in the node. This is configured with a cable stub fusion spliced to the outdoor fiber optic cable, or the cable is brought into the node and fusion spliced onto pigtails to the electronics.

The third area where splicing is performed is at field points, where outdoor cables are spliced together to continue lengths or as dictated by the planned cable route.

By nature of the system, cable TV operators demand low splice loss (attenuation) and low reflectance to ensure exceptional signal quality. But just how low do you go? At some point, there is a cost trade-off between trying to get the splice loss of each fiber extremely low vs. productivity penalties associated with achieving extremely low loss.

It is important to define a systemwide splice loss specification, and use the splicing methods and procedures which provide the lowest splice loss and reflectance while limiting labor costs of the system's construction. Single fiber fusion splicing technology has evolved to provide low average splice loss (as little as 0.02 dB under ideal conditions) and negligible reflections (greater than 70 dB return loss). Improvements in fusion splicing equipment and fiber geometry control have led to the routine attainment of low loss splices.

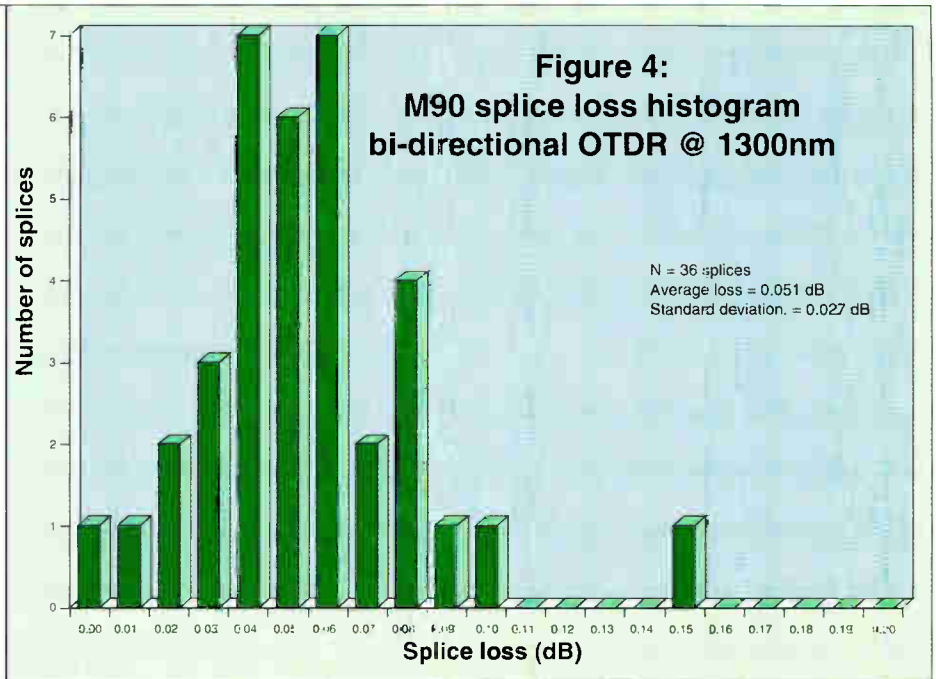
Automated splicing

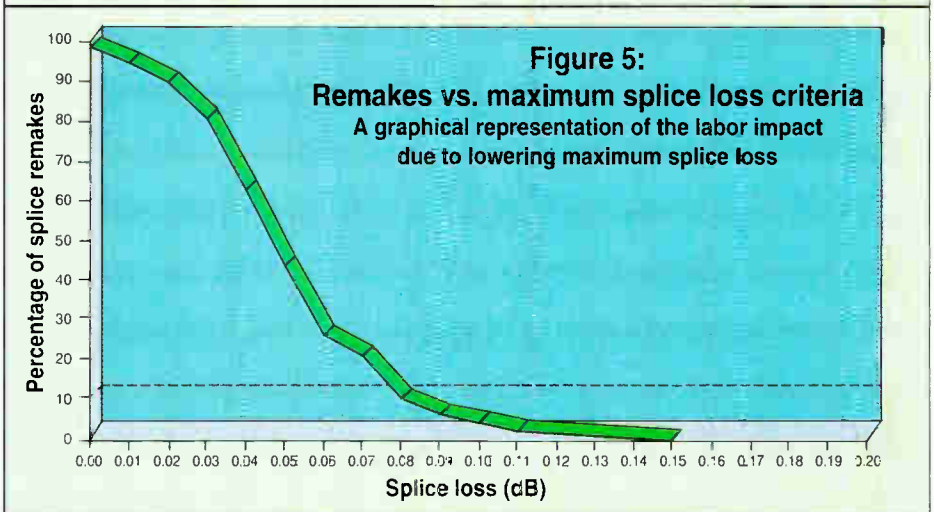
Automated fusion splicing machines can provide highly accurate estimated or actual splice loss readings using a profile alignment system (PAS) or a built-in power meter/source.

With the PAS feature, a built-in computer and video system locates the center line of both fibers being fused. Fibers are then aligned on both the x and y axes prior to fusing. Some PAS units display and utilize an image of the fiber cores, which the computer brings into alignment prior to fusing. Others perform the alignment using the fiber cladding profile; however, proper alignment is dependent on core/cladding concentricity (a function of proper fiber manufacturing, it involves the centering of the core on the fiber). Splice loss estimates are calculated based upon detailed measurements by the video system of axial and angular offset of the fibers at the splice joint.

A local injection and detection (LID) unit is a power alignment system self-contained at the fusion site. The greater accuracy of splice loss estimations in these systems permit fusion splicing with greater confidence and therefore reduces time, cost and complexity of the fiber optic cable splicing process. The LID unit incorporates both local injection and detection of light at a splice point. By injecting light directly into the core of the fiber and maximizing the optical power reading before the splice is made, the optimum fiber core alignment is obtained. The relative splice loss can be determined by measuring the change in optical power through the splice before and after the splice is made.

Fiber alignment, splicing and evaluation can be performed at the same time and location with a high degree of confidence, thus increasing productivity without sacrificing splice quality. Both end angle and end face quality of the





fibers are measured before splicing, and actual measurements of splice loss are given following the fusing procedure.

Splicing considerations

Fusion time optimization is a feature of some LID-equipped units to monitor the amount of light through the splice during the splicing process. As long as the amount of light getting through the splice is increasing, the machine continues to fuse. When the amount of light through the splice is maximized, fusing is halted automatically. The optimization feature provides the lowest possible splice loss over a wide range of splicing conditions.

Many fusion splicers available automatically evaluate the cleaved fiber ends. Quality cleaves are a prerequisite for good splice results. Unacceptable results are shown on a display before splicing begins. This increases productivity and lowers the average splice loss obtained because the machine rejects possible problem cleaves early in the splicing process.

Studies have been performed to show that internal measuring systems of fusion splicers provide accurate readings of actual splice loss. In fact, the splice loss estimations of the automated machines on the market today are much more accurate than unidirectional optical time domain reflectometer (OTDR) measurements (See Table 1).

Another impact on splice quality is fiber geometry, including fiber core concentricity and fiber cladding diameter tolerances. The importance of fiber geometry to splicing efficiency is supported by fiber optic industry specifications. These documents state that smaller tolerances on cladding outside diameter reduce splice loss and improve fiber joining yields. The current Bell Communications Research TR-20 standard calls for an outer fiber cladding diameter of 125.0 µm with a tolerance of ±2.0 µm. The future objective of this standard is ±1.0 µm around the nominal of 125.0 µm. Fiber meeting this specification is being made today.

Real-world issues

So, if today's optical fibers have been improved and fusion splicers can provide such incredible splice loss readings as 0.02 dB, what's wrong with defining 0.05 dB as the maximum individual splice loss specification? Consideration should be given to "real-world" splicing issues, and systemwide vs. individual splice loss should be addressed.

Splice equipment manufacturers often indicate the lowest attainable splice loss with the caveat that the splice losses are measured on a single fiber that is broken and spliced back together and therefore removes manufacturer tolerance effects from the splice losses cited. In real-world systems, fibers with a distribution of fiber geometries due to manufacturing tolerances (of one or more manufacturers' origin) must be fusion spliced together, impacting splice loss.

Environmental factors, dust and wind for example, may also impact splice readings, especially when compared to fibers spliced in labs. Under laboratory conditions, there are few contaminants and temperature/humidity are held constant. Field splicing crews may have little control over the environmental conditions under which they must splice and therefore may not obtain average losses as low as those obtained under ideal conditions.

Installer experience can affect the splice loss outcome. More experienced

installers tend to have a larger percentage of acceptable, first-time splices and lower average losses than those installers without much experience.

Next, system loss and individual splice loss must be considered. The loss values that a system designer should address are the average splice losses over the entire span. Individual splice loss specifications, no matter how tight, cannot always be met, due the various factors cited earlier. All these factors may prevent even the best installers from achieving the desired loss values for every splice. The fiber optics industry, as a result, stresses the use of span average losses for calculating end-to-end attenuation.

The purpose of citing individual splice loss in splicing specifications is to ensure that exceedingly high splice losses are not retained and simply passed through by averaging all the system splices. A 0.10 dB maximum value for fusion splices is an excellent compromise between higher splicing labor costs from productivity penalties and minimal splice losses that can reasonably be achieved in the field. As Figure 4 shows, most of the individual splices made with a fusion splicer in the field will produce splice losses better than or equal to 0.10 dB.

A basic rule of thumb

This is not to say 0.05 dB maximum splice losses can't be reached; in actuality, they can. However, because of the real-world factors indicated above, it will take a large number of splice remakes to achieve these readings. As a result, the amount of time the installation crew spends splicing and resplicing will become counterproductive. If maximum splice loss criteria is established at 0.10 dB, remakes will tend to be infrequent; less than 10 percent of the attempts will have to be remade. As the criteria for splice loss becomes smaller, the number of remakes increases. As an example, for 0.04 dB maximum specification, remakes may exceed 60 percent; for a 0.02 dB maximum specification, remakes are nearly 90 percent (See Figure 5).

So what's a crew to do? As a rule of thumb to ensure system quality and installer productivity, the following thumb rule is recommended:

Table 1: Splice Loss Estimate Accuracy

Range between actual splice loss and estimated loss	Percent of splice loss estimates within range		
	Unidirectional OTDR measurement	PAS estimate	M-90 LID-System estimate
± 0.05 dB	54%	85%	88%
± 0.10 dB	78%	92%	100%
± 0.20 dB	97%	98%	100%
± 0.30 dB	99%	100%	100%

An acceptable splice must have a fusion splicer estimate of 0.10 dB or less based on LID unit or PAS readings. If, after three attempts, a splice with a splicer estimate of 0.10 dB or less is unachievable, accept the next splice that is within 0.05 dB of the lowest of the first three attempts.

The more time spent splicing, the more it costs a system operator. If the remakes are kept at under 10 percent, installation costs should not be impacted excessively. If over 10 percent of the splices are remade, the cost to install the system will increase because of the increased time taken for system installation.

Measure the whole system

Once the splicing is completed with acceptable splicer estimated losses, the entire cable system should be checked using an OTDR at 1550 nm, located at the headend. The intent of this OTDR check is to verify there are no extraneous losses due to effects not attributable to the actual splices. For example: added loss attributable to micro-bends or macro-bends of the fiber in the splice tray, a kinked buffer tube or cable damage.

Attenuation tests should be taken from the headend to each node.

For loss at a splice point that is greater than 0.5 dB, inspect the splice point for possible added loss attributable to excessive bends. If none are noted, resplice. For losses less than 0.5 dB, the actual loss is acceptable and the higher value is attributable because of unidirectional OTDR error from mode field diameter variation. If actual splice loss must be confirmed, then bi-directional OTDR measurements are required.

Overall span attenuation should be measured next. For unterminated fibers, OTDR tests from the headend should be conducted at the wavelength(s) of the actual (or potential) system electronics. Therefore, dual wavelength single-mode fibers should be tested at 1310 nm and 1550 nm to determine total span losses. For terminated fiber spans, the insertion loss and return loss should be measured. High reflectance at the transmitter laser can have adverse effects on the laser's performance, so return loss is especially critical at the headend.

End-to-end attenuation tests should be taken from the headend to each node where the fiber is connectorized. Optical properties of the fibers, splices, connector and other components contribute to the total attenuation of the cable plant. The end-to-end test should be compared to estimated losses for the entire system. If the two tests compare accurately, the job is completed.

If, for some reason, there are discrepancies, troubleshooting at the nodes is recommended to isolate the problem and fix it.

All of these tests should be conducted from one direction only, transmitting from the headend. Testing in both directions increases cost while yielding no significant additional information. Finally, an OTDR signature trace should be taken of all the fibers transmitting from the headend to the nodes. Documentation of the as-built system on computer disk or as printed traces provides the most useful information for maintenance, restoration and upgrades.

Conclusion

Bottom line, a systemwide specification of 0.10 dB maximum splice loss provides the optimum balance for high quality without compromising installer productivity. Use the thumb rule to keep splice remakes and costs at a minimum. CED

Subscriber-friendly ordering of near-video-on-demand

Part II of a two-part story

In last month's installment, we looked into the system configuration and hardware requirements for implementing M/PPV (multiplexed pay-per-view.) Time Warner uses this method for offering near-video-on-demand to its "Quantum" service customers at its Brooklyn-Queens cable system in New York City.

Using the set-top convertor or remote control, the subscriber has several different options for ordering an M/PPV movie. With the system's OSD (on-screen display) approach, a printed guide is not needed. However, if the subscriber has access to a printed PPV schedule, for example, the purchase can be made based on the channel number and time. On the other hand, if the schedule is not known, a purchase can be placed based on the movie title. The subscriber can either:

- tune the PPV channel directly,
- directly order the PPV title by name from a list of available titles,
- directly order from PPV titles in an assortment of categories e.g. new hit movies, classics, action/adventure, adult, drama, family, etc. or,
- directly order from all available PPV movies that are running now or are about to start.

In all but the first option, knowledge of the channel number and start time is not necessary. Let's look in detail at each of the five options. Examples will be shown.

M/PPV—direct access—with promotion channel. This scenario is illustrated in Figure 6. First, let's assume that the subscriber finds out about an M/PPV movie through a printed guide or some other means, so that the channel number and start time are known. Starting from any channel (a), the subscriber tunes the desired M/PPV channel and the con-

By Dan Wiltshire, Systems Engineer, Pioneer New Media Technologies, Inc.

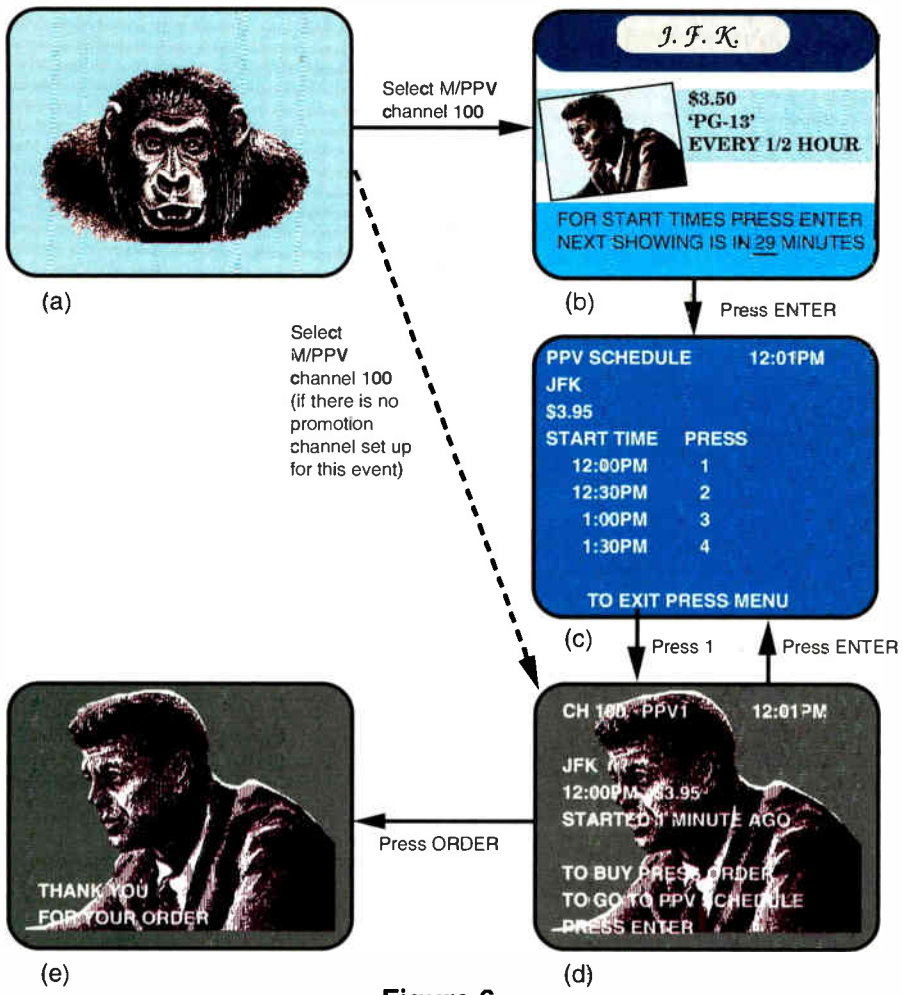


Figure 6

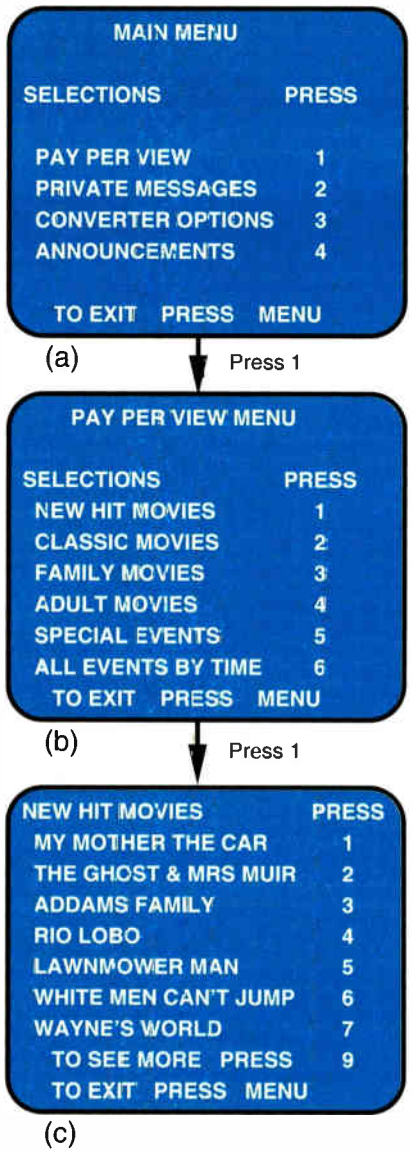


Figure 7

vertor reads the data contained on it, causing it to instantly jump to the promotion channel (b). The subscriber can watch this promotion channel for any length of time, to get a better idea of what the film is all about.

Promotion channels also usually contain M/PPV data signals, making them function as "guide channels." (More detail on guide channels was included in last issue's article.) While tuned to a guide channel, the convertor is reading the data signal containing ordering information. When the subscriber exits the promotion channel by pressing "Enter," the OSD shows the movie schedule over a solid-color background (c).

All of the showings displayed here are currently available for sale and may include one that has already started. The subscriber selects one of these showings by pressing 1, 2, 3 or 4. In this example, the subscriber wants to see the showing that has just started and presses "1." By acting on the convertor-instruction portion of the received data, the convertor knows that it should tune to channel 100 (d). At this point, the showing is still within the pre-determined free-view window, so the order prompt is superimposed over the program video.

The following choices are presented: To buy, press Order. To go to PPV schedule, press Enter. Here, the subscriber can press Order and directly buy the movie. A "thank you" message is displayed briefly, and then disappears (e) so that the rest of the movie is viewed uninterrupted. If Enter is pressed, the convertor again reads the guide channel data and displays the schedule.

M/PPV—direct access—without promotion channel. It is not necessary to have a dedicated (6-MHz) promotion channel for each M/PPV program. There may be a movie whose buy-rate is predicted high enough not to require the investment in the spectrum space for a promotion channel.

Let's review the subscriber action taken in the earlier example, assuming that this time the M/PPV movie has no promotion channel. When the subscriber enters the channel number, as in Figure 6 (a), the OSD order screen will be shown instantly (d) instead of going to the promotion channel (b), as indicated by the dashed line. If the subscriber wishes to see the program schedule for the other showings of this movie, this can be done by pressing Enter.

Because there is no promotion channel, the movie's guide channel is on another frequency not otherwise associated with the movie. The convertor must still off-tune to read the data for OSD, but the video and audio content of this guide channel are never shown as part of the process.

M/PPV—menu access—with promotion channel. Here we see the real advantage of M/PPV ordering using OSD. Menu access is of great value when the subscriber does not

know the schedule or channel number of a desired M/PPV movie, or there are large numbers of movies from which to select.

The set-top convertor has a Main Menu function which can be accessed at any time by pressing the Menu key. The format and exact wording of the Menu contents can be customized by the system operator. The Main Menu display and control information are sent by the system's main controller computer. (A sample Main Menu screen is shown in Figure 7 (a).) When the subscriber selects "1", Pay Per View, the convertor displays a list of the types of movies currently being shown (b). The last option, All Events By Time, lists all of the movies which are currently purchasable. These movies are those now being shown or scheduled to be shown starting at the next few half-hour intervals.

After the subscriber makes a choice from this menu, the convertor quickly scans through all the M/PPV channels, hiding its scanning action from the subscriber behind a solid-color display background. The convertor quickly compiles the ordering information for all of the available movies and displays their titles (c).

Figure 8 shows the process for ordering through the menu when a promotion channel is available for the movie. As described earlier for M/PPV—direct access—with promotion channel, the convertor tunes to the promotion channel when the movie is selected (b) and the schedule is displayed when Enter is pressed (c). In this example, the subscriber has selected the current showing that has started six minutes ago by pressing "1." The purchase window is still open, as seen by the message "To Buy Press Order," but the Free-view window has expired, since the video can't

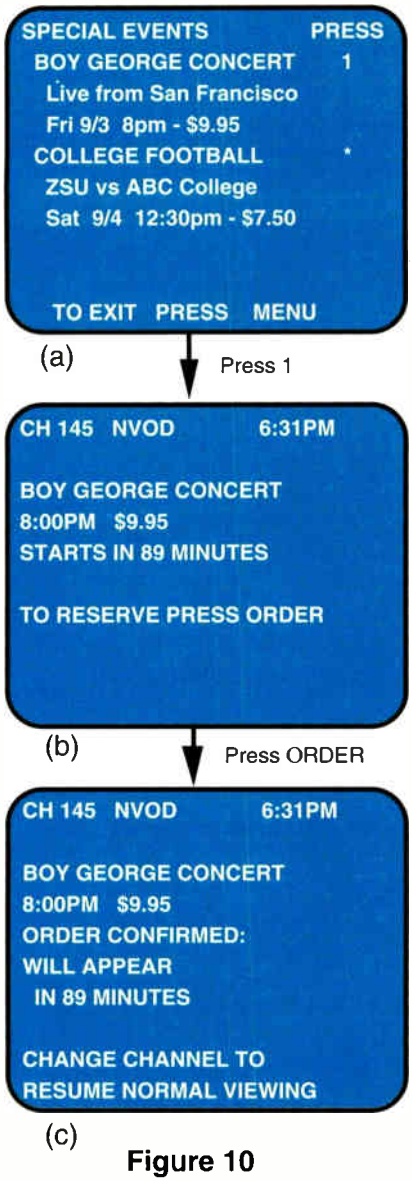


Figure 10

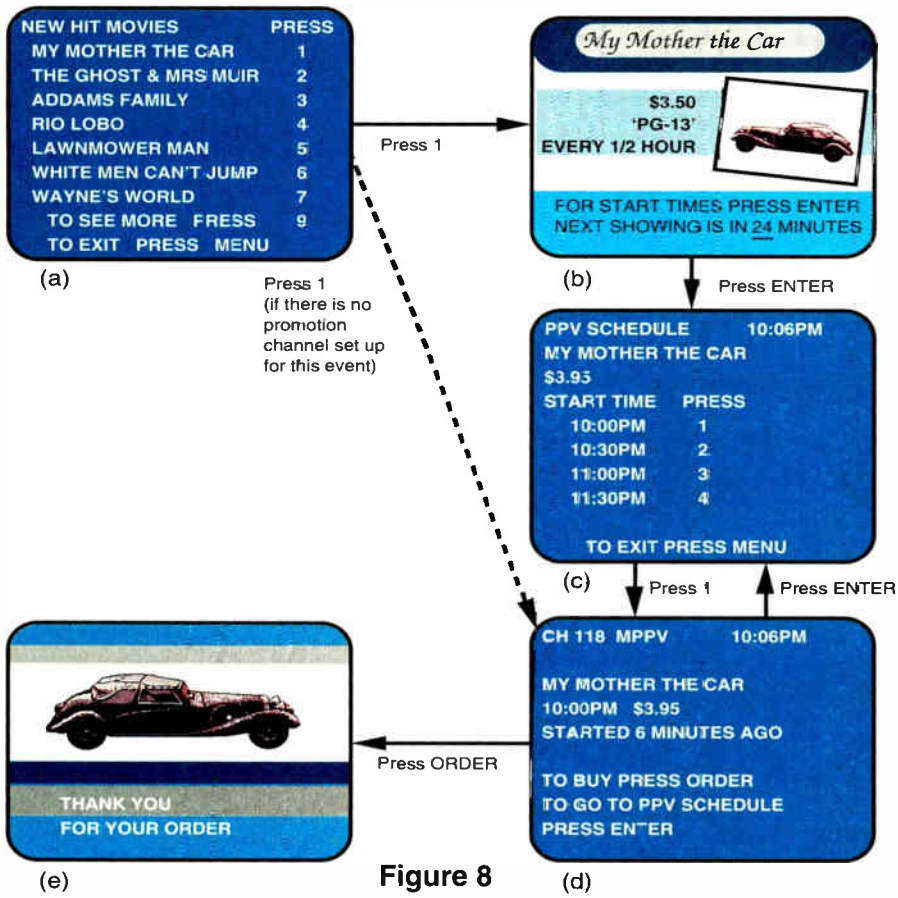


Figure 8

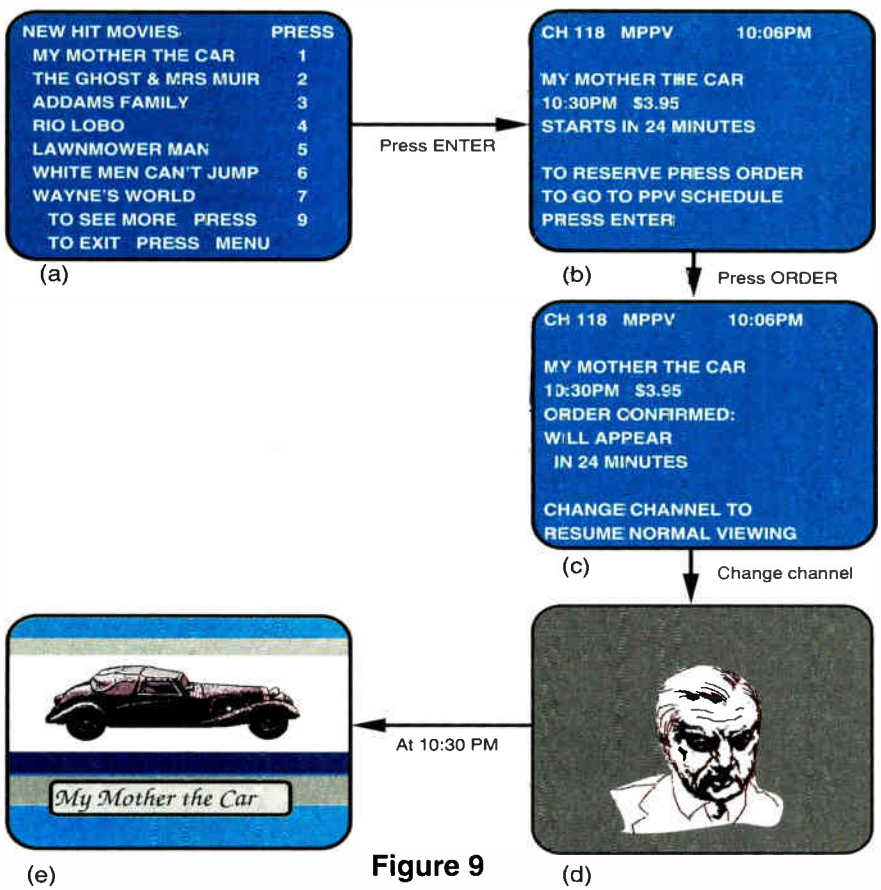


Figure 9

be seen behind the text (d). The background remains a solid color until Order is pressed.

M/PPV—menu access—without promotion channel. This example also illustrates the future-event reservation feature. The order process is essentially the same as described above in number 3, with one exception. As Figure 9 shows, when the menu choice is entered, the convertor displays the order screen for the movie (b). In this example, the subscriber orders the next showing of the movie by pressing the Order key. Since the movie has not yet begun, the OSD now confirms that the order is reserved (c). At this point, the subscriber can either change the channel (d), shut the convertor off or stay tuned to the confirmation screen (c). Precisely at the start of the movie, the convertor will switch on (if it was turned off) and tune to the channel carrying the movie (e).

Non-multiplexed IPPV. Special one-time events, of course, cannot be multiplexed. In addition, some of the less-popular movies may be offered on only one channel and are thus not multiplexed. In these cases, the ordering process is the same as for a multiplexed event, except that the PPV schedule step is skipped. Figure 10 is an example which shows how a non-multiplexed event can be accessed through menu selection. Here, the first event shown is purchasable (a). The second event, since it is further off into the future, can not be reserved yet, as indicated by the asterisk. The future event is listed solely to promote it as an upcoming attraction. Non-multiplexed events can also be purchased directly, as in the preceding examples, assuming the channel and start time are known in advance.

Other functions

M/PPV offers many other flexibilities. By accessing the convertor Options selection from the Main Menu, as shown in Figure 11, the reservation for an M/PPV (or for a non-multiplexed IPPV) event can be canceled.

The M/PPV system also allows a bonus movie function. This gives the subscriber one free movie of a certain genre, with the purchase of another.

When a subscriber's pre-set PPV purchase limit has been exceeded, a warning message appears whenever Order is pressed. This message is downloadable and can contain the telephone number of the customer

service department who can relay the reason for the order denial.

The future of M/PPV

Enhancements are now in the works to provide even more flexibility and subscriber friendliness for future generations of M/PPV convertors. New features will include such functions as review, pause/resume, and M/PPV operation by on-screen cursor entry.

Another unique application involves the mixing of one-way addressable and two-way impulse-capable convertors in the same system. The next generation of M/PPV service will allow many of the PPV features to be used on the one-way convertors as well as the two-way convertors. All menus, displays and functions are the same on both convertors, except for the actual movie purchase method. CED

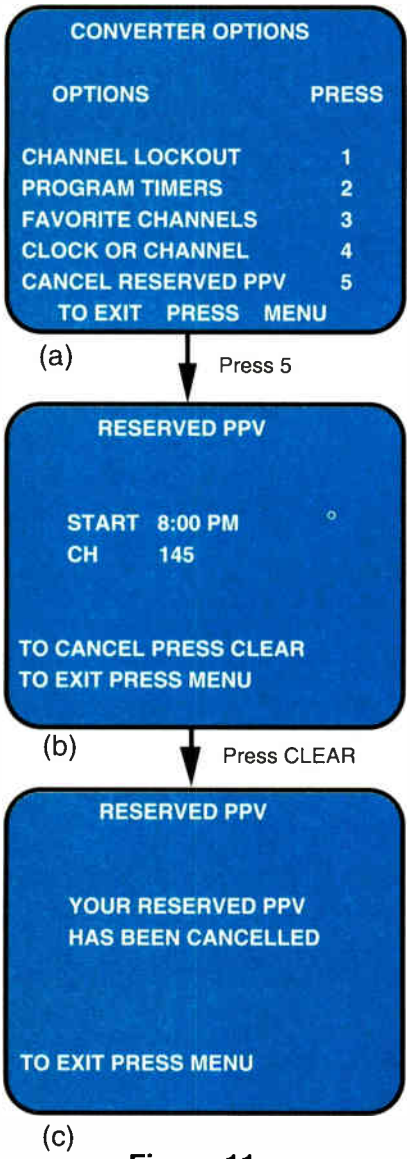


Figure 11

References, acknowledgments

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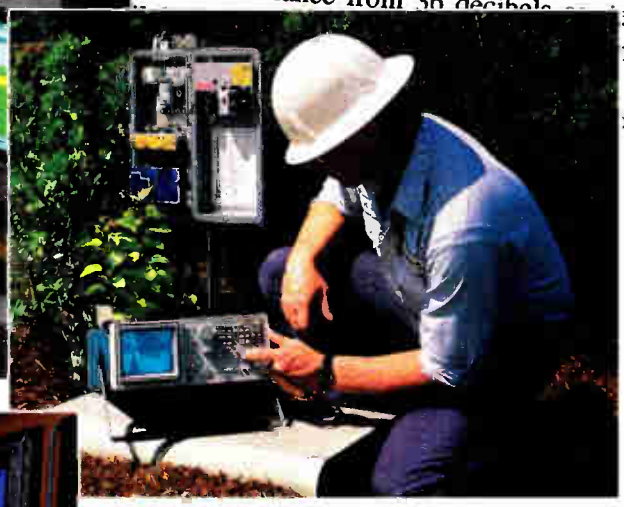
2. Burroughs, Robert S., and Qun Shi, Panasonic Technologies Inc., "Comparison of Near Video on Demand Methods for CATV," 1992 NCTA Technical Papers.

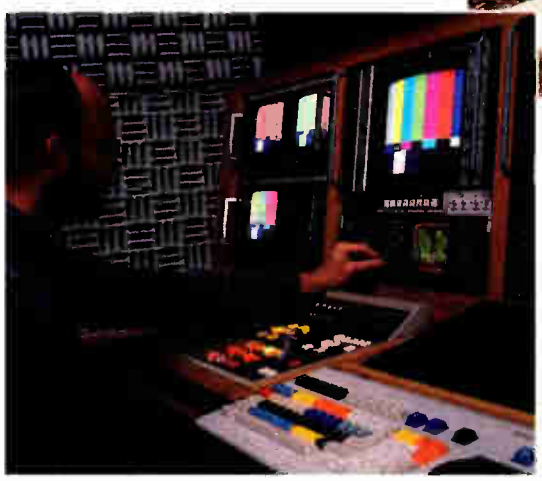
3. Additionally, I would like to thank Mr. Ray Tozaki of the Software Engineering department at Pioneer New Media Technologies, Inc. for his tremendous help in educating me about M/PPV to a level where I feel comfortable in educating others about it.

No problem!



(ABOVE) THE CMP500 CABLE TELEVISION MEASUREMENT PACKAGE — COMPLETE BASEBAND VIDEO AND RF MEASUREMENT CAPABILITY, INCLUDING ALL FCC PROOF-OF-PERFORMANCE REQUIREMENTS.

(RIGHT) A WAVEFORM MONITOR, VECTORSCOPE AND NTSC GENERATOR CONSTITUTE A LOW-COST SYSTEM FOR EFFECTIVE BASEBAND MONITORING.



(ABOVE) THE 2714 CABLE TV SPECTRUM ANALYZER AUTOMATES ALL COMMON CABLE SYSTEM SPECTRAL MEASUREMENTS, INCLUDING THE FCC RF PROOF-OF-PERFORMANCE REQUIREMENTS.

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r technical standards

to comply with the new set of standards, operators will be required to conduct baseband video proof-of-performance tests. Specifically, these will include chrominance-luminance delay inequality, differential gain and differential phase measurements.

In order to create a uniform, nationwide scheme, the FCC said its standards will preempt local standards. However

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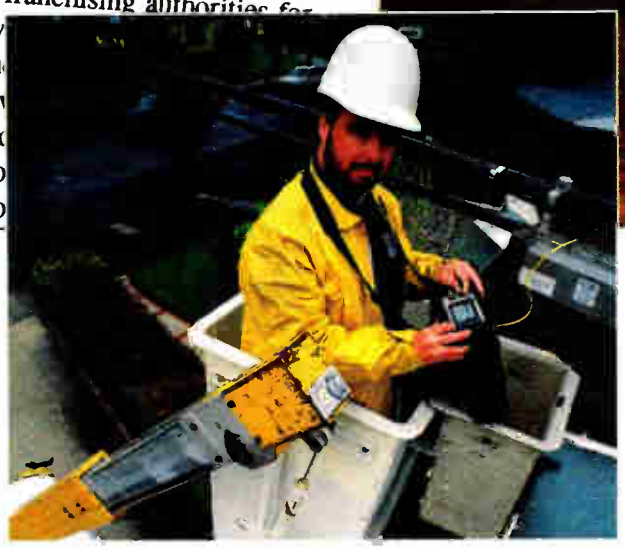

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NCTA Show tech sessions promise to be lively

Look for sparks to fly next month when representatives of the cable industry clash with members of the consumer electronics industry over compatibility issues.

No fewer than three technical sessions are planned on the subject during Cable '93: The National Show, slated for June 7-9 at San Francisco's Moscone Center.

Perhaps the most lively discussion will come on Tuesday at 2 p.m. when William Bresnan will attempt to moderate a debate on the subject. Scheduled to appear on the panel are Dr. Walter Ciciora of Time Warner Cable, who will square off with Gary Shapiro of the Electronic Industries Association (the consumer electronics industry's lobbying organization), Joseph Donahue of Thomson Consumer Electronics, and David Rozzelle. Playing the role of reactor will be Wendell Bailey of NCTA.

If that isn't enough, two other sessions will directly and indirectly touch on the emotional issue. The first will be Vito Brugliera's session on a subscriber-friendly future, which is designed to provide an update on what is happening to the interface between cable service and consumer electronics equipment–with a review of recent technology intended to make the subscriber's life easier.

Finally, Alex Best of Cox Cable will supervise a panel discussion of "smart card" technology that is intended to answer the question: "What options do operators have when choosing program security systems and methods?" Operators are asked to attend this session armed with plenty of questions.

They won't have to look far to come up with lots of questions. In this issue, the editors of *CED* explored the issues of compatibility and smart cards and found plenty of contention and few perfect solutions. See pages 47 and 50 to get some idea of the issues involved.

New technologies

Other enticing sessions include Dan Pike's panel on new technology that will review some of cable's leading-edge engineering tools that can enhance current services and enable new business opportunities.

Slated speakers include:

- Lisa Bell of Arrowsmith Technologies, who will detail a Cox Cable field trial of an improved dispatch system that utilizes the nation's global positioning system (GPS) and intelligent software to improve efficiency and field service productivity;
- Tom Straus of Hughes, who will compare microwave propagation at 13 GHz, 18 GHz and 28 GHz. Straus will predict the reliability of the new MLDS services that operate at 28 GHz;
- Ed Zylka of Zenith will discuss advanced data communication applications and how they relate to evolving two-way cable services. His focus will be on new modulation techniques and solutions to today's problems;
- Bell Northern Research's Heather Sinnott will examine infrastructure issues, economics, technical characteristics and business alliances related to personal communications services. This discussion is aimed at educating potential non-traditional telephony providers on just what to expect from PCS.

New services

In addition, Paul Resch will moderate a panel called "New service capabilities," that examines what can be done to foster two-way and other expanded services' profitable migration to cable. Three of the five presentations will be made by representatives of Zenith Cable Products, a company with a long history of interactivity in cable TV. The other two speakers represent Digital Equipment Corp. and Philips Broadband Networks.

Other sessions will provide details on subjects ranging from headend advancements to digital compression and distortion reduction. CED

By Roger Brown

NCTA Show technical sessions at a glance

Monday, June 7

1:30 to 3 p.m.

System architecture—Designing the highway to tomorrow

Speakers: Gino Caira, Stephen Dukes, Andy Paff, Gary Chan

Toward a subscriber-friendly future

Speakers: Daniel Sutorius, Bob Burroughs, Joe Glaab, Ron Katznelson, Mack Daily

3:15 to 4:45 p.m.

Techniques for reducing distortion and interference in tomorrow's cable systems

Speakers: Tom Jokerst, Peter Dierlein, Jeff Hamilton, Keith Emig, James Refi

Smart conditional access

Speakers: Graham Stubbs, John Taskett, Andy Trott, Tony Wechselberger

Tuesday, June 8

10:30 to noon

New technology

Speakers: Tom Straus, Heather Sinnott, Paul Baran, Edward Zylka, Lisa Bell

New service capabilities

Speakers: Jeffrey Cox, Allen Anderson, Frank Domina, Jim Albrycht, Caitlin Bestler

2 to 3:30 p.m.

Digital compression transmission

Speakers: Joe Waltrich, Brian Bauer, Rich Citta, Steve DeHart, Fred Harris

A compatibility debate

Speakers: Walt Ciciora, Gary Shapiro, Joseph Donahue, David Rozzelle, Wendell Bailey

4:45 to 5:15 p.m.

Headend advancements

Speakers: Larry Moreland, David Koo, John Rossi, Daniel Moloney, Ned Mountain

Cable reregulation—Measurements, EBS, DPU and you

Speakers: Rex Bollinger, Roger Pience, Joseph Stern, Ken Wright

Wednesday, June 9

9 to 10:30 a.m.

Fiber refinements and trends

Speakers: M.F. Mesiya, Moshe Nazarathy, Rob Plastow, Michael Labiche, Henry Blauvelt

Implementing digital compression and ATV

Speakers: Brian James, Kenneth Metz, Craig Cuttner, John Holobinko

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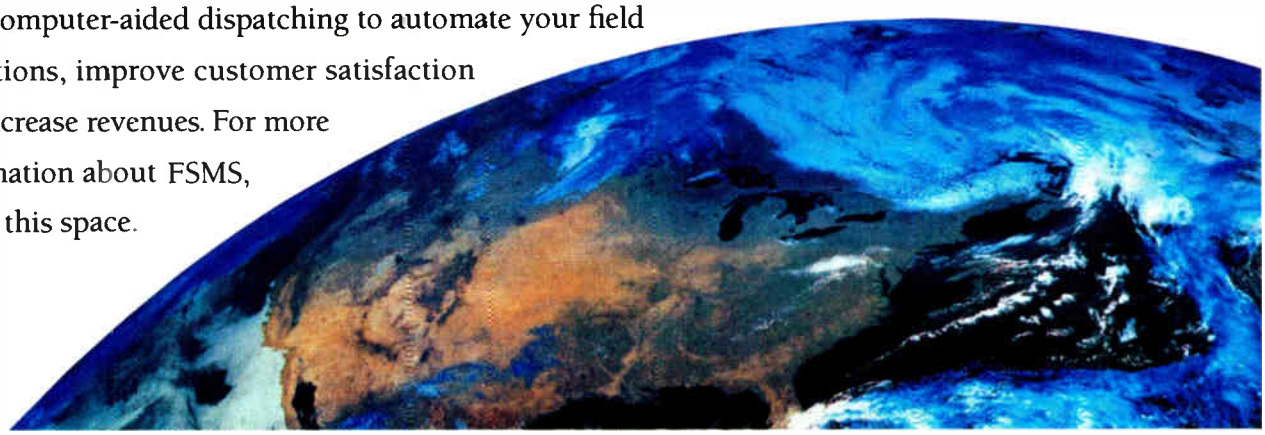
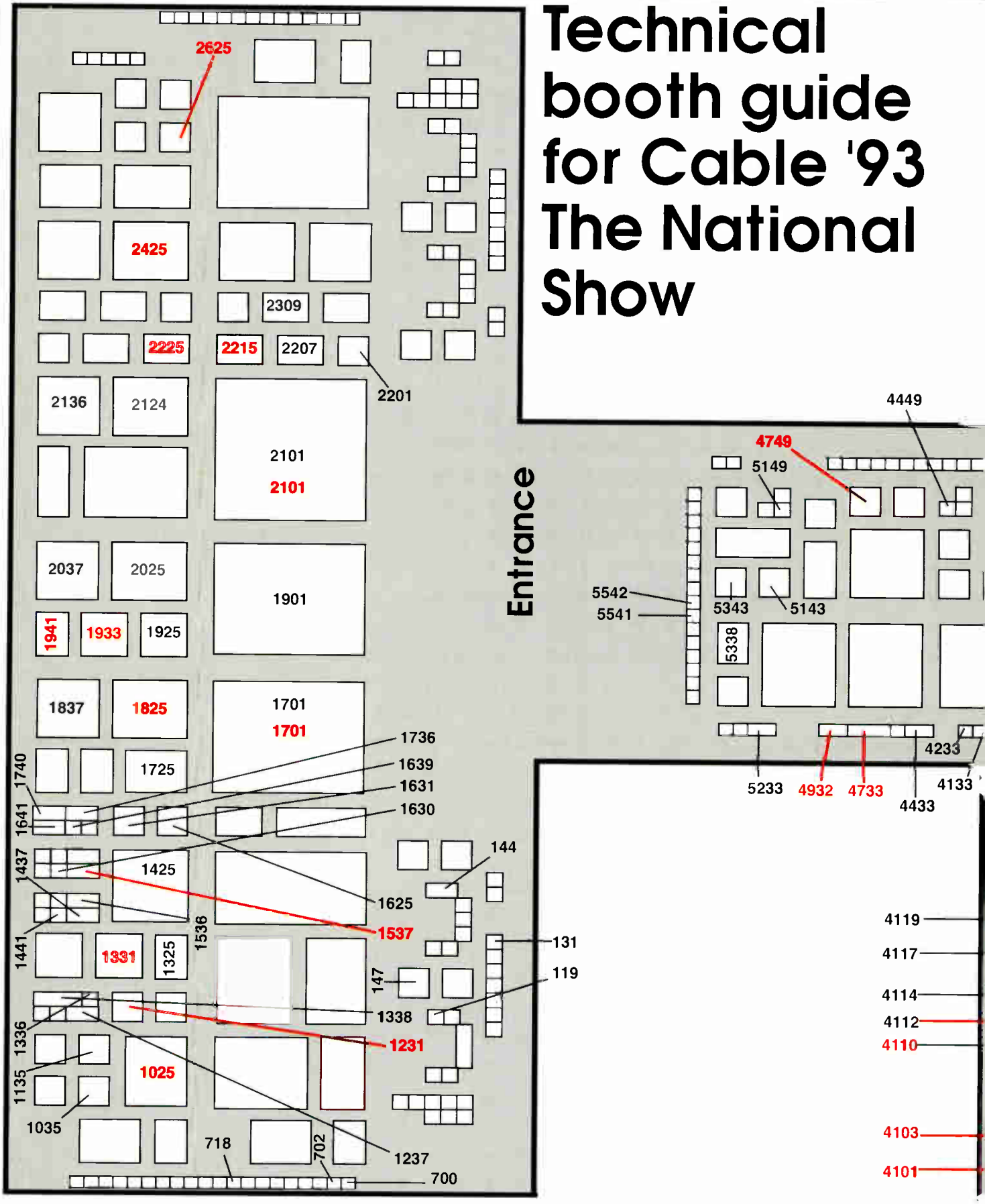


Technical booth guide for Cable '93 The National Show



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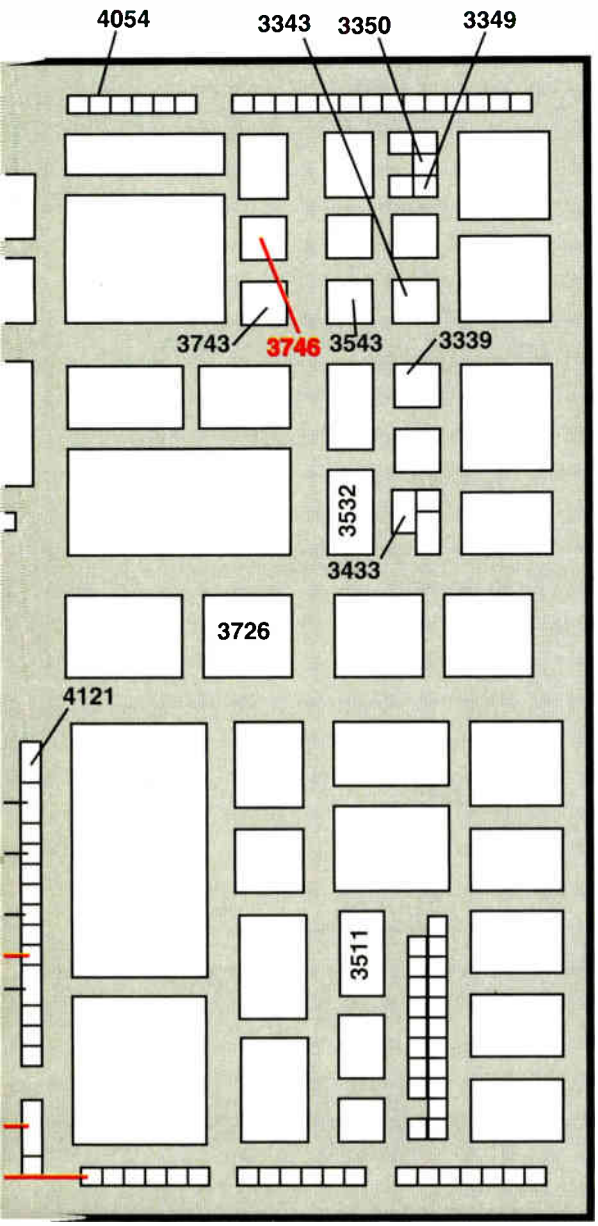

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Antenna Technology.....Booth #4233

AT&T.....Booth #1639

AT&T Network Systems .Booth #2101

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Northern Telecom Inc.....Booth #3350

Ortel Corporation .....Booth #5143

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Pioneer New Media Tech., Inc.....Booth #2025

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Compatibility inquiry polarizes industries

The battle over compatibility between cable systems and consumer electronics devices is heating up to the boiling point, judging from some of the 29 sets of comments submitted in response to the Federal Communications Commission's notice of inquiry into compatibility.

A quick read of the comments submitted by the NCTA and various cable operators and the Electronic Industries Association and TV manufacturers shows contention on nearly every point. As part of last year's Cable Act, Congress directed the Federal Communications Commission to explore ways to improve compatibility between cable hook-ups and consumer TVs and VCRs.

Specifically, the FCC was ordered to search for methods to overcome many of the problems that have plagued consumers since the advent of VCRs and extended tuning range televisions, including watching one channel and recording another simultaneously; taping two consecutive programs that appear on different channels; and using advanced television features such as picture-in-picture.

What it all boils down to is this: electronics manufacturers want a national scrambling standard or cable signals to be delivered "in the clear" so that cable drops can be directly attached to TV receivers, while cable interests are demanding a standard for "cable-ready" TVs and the inclusion of a decoder interface plug on the back of new TVs and VCRs.

National scrambling standard

Gary Shapiro, group vice president at EIA, adamantly defends EIA's call for a national scrambling standard. With a standard, electronics manufacturers can build devices which will work in any cable system and consumers can hook them up right out of the box. He says Congress mandated that the interface must be improved and that the FCC has few if any choices. "There is no discretion in the law," Shapiro says.

The cable industry, however, is worried that a national scrambling standard will lead to potentially greater piracy. "The most severe problem with a national scrambling standard is the lack of alternatives if it is defeated," says Time Warner in its comments to the FCC. "If a national scrambling standard was imposed and later compromised, there would be no way to re-implement security without rendering the subscribers' equipment unusable."

The cable industry's concerns over piracy are "total malarkey," says Shapiro. He notes that the cable industry presently estimates its losses to piracy at about $5 billion—or 20 percent of the industry's total revenue. "The alternative we're proposing would bring that loss rate down close to zero," Shapiro says. "It works well for the satellite industry."

"If it works so well in the satellite industry, why are there 3 million dishes and only 600,000 authorized receivers?" wonders Wendell Bailey, vice president of science and technology at NCTA. The problem with a national scrambling standard is that there is no way to turn back if the standard is broken by pirates. "Am I willing to bet my entire business (on a standard)? The answer is no," says Bailey.

NCTA even disputes EIA's version of history, noting that the cable industry was forced to develop and deploy set-top frequency converters when systems began to offer more than 12 channels because televisions were unable to tune the additional channels. The practice continued because TV manufacturers used poorly shielded tuners, resulting in video impairments. It became problematic only after the manufacturers began touting their devices as "cable-ready," the NCTA argues.

"Diversity in scrambling methods is a security technique in itself," comments Time Warner. "Diversity complicates

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the task for those who would go into an underground business of supplying devices which defeat the scrambling." If that happens, cable operators will have to once again install a set-top descrambler—a cost that will be borne by the subscriber, the MSO argues.

"There's no question the electronics people are trying to force cable to adopt interdiction or broadband descrambling," says Joseph Van Loan, senior vice president of engineering for Cablevision Industries. "We're looking for evolutionary solutions and we believe we have them."

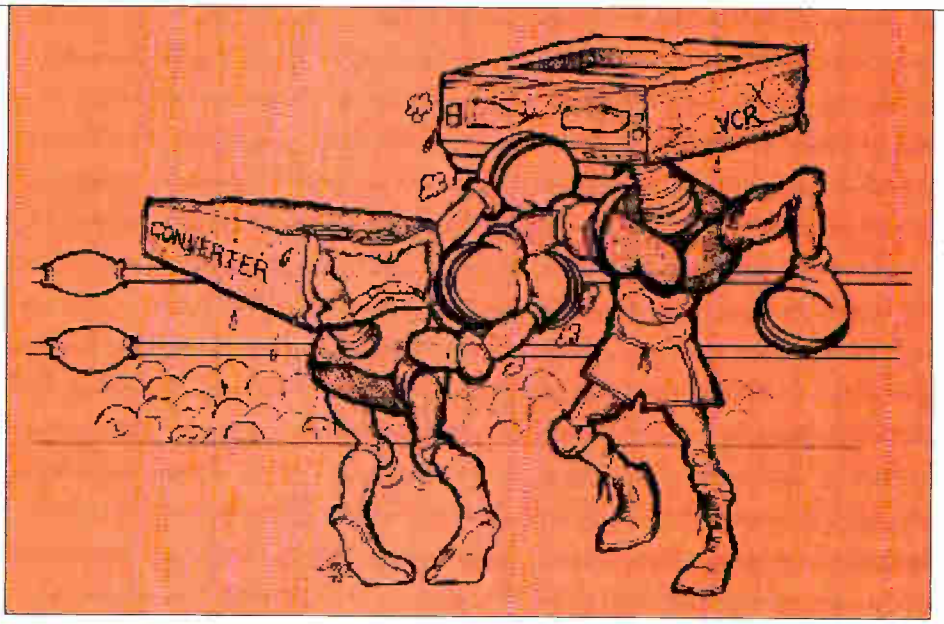
Those solutions include bypass switches that route non-scrambled signals around the descrambler to the television, universal remotes that control TVs, VCRs and cable descramblers, dual-tuner descramblers that pass two video channels instead of just one, and devices like VCR Plus, which can be programmed to automatically record programming delivered through a cable descrambler.

The NCTA says the cable industry is prepared to offer these devices, at "reasonable cost," to consumers. Although NCTA admits the devices are not "100 percent solutions," they "certainly qualify as 80 percent or 90 percent solutions."

Broadband descrambling

Interdiction, of course, has enjoyed high-profile exposure but has been deployed in fewer than 75,000 homes, according to comments filed by Scientific-Atlanta, the technology's major proponent. Cable systems have been reluctant to adopt the technology because of its higher initial hardware cost, increased power consumption (which the cable operator must pay for) and concerns over security.

For example, Nick Worth, executive vice president of engineering at TeleCable, studied "clear-channel" security systems such as interdiction and trends in programming and determined that there will be a need for flexible conditional access, driven by a greater demand for choice. Furthermore, because of the high initial costs of interdiction, a detailed analysis by Worth showed that a typical cable system would actually lose $2.3 million over a nine year period, he says.



As for broadband descrambling, the technology shows some early promise, but hardware has not as yet progressed beyond the laboratory. As conceived, the system would descramble several channels simultaneously and deliver a wide spectrum of channels directly to the home, simplifying the interface to consumer gear. Ron Katznelson, president of Multichannel Communication Sciences Inc., the company which holds a patent for the technology, predicts a system could be put into volume production as early as the latter half of 1994.

For its part, the NCTA wants the FCC to establish a standard for "cable-ready" TVs and VCRs. This standard should encompass specifications for improved tuners, improved shielding from direct pick-up interference and a decoder interface connector such as the one known as ANSI/EIA 563. This connector standard, which was developed by the NCTA/EIA joint engineering committee in the mid 1980s, is a small device that could be located on the back of TVs and VCRs that descrambles cable programming virtually transparently and returns the advanced functions of TVs and VCRs.

Popularly known as "MultiPort," the device has already been tried, but failed in the marketplace. In order to work, TVs and VCRs must be outfitted with a receptacle that accepts inputs from the decoder. RCA, among others, built millions of TVs with the plug but only a few hundred decoders were ever brought into the market. This was because cable operators were reluctant to give up the revenue stream associated with converter and remote control rentals.

Now, however, operators would be more amenable to the device because under the new regulations, that revenue stream will likely melt away. "Sometimes it takes a deadline or requirement to make it work," says Worth.

But both EIA and the electronics manufacturers are dubious. They note that EIA 563 will do nothing to improve compatibility with the 280 million TVs and VCRs already in the marketplace. Furthermore, they argue that they should not have to bear the additional cost of the plug because the industry is highly competitive and profit margins are low or nonexistent.

"No one wants to return to that," says Shapiro. "It's expensive to put in and doesn't solve a lot of the problems."

Worth disputes that, noting that in Overland Park, Kan., where TeleCable implemented the decoder, consumers were pleased with the decoder and that they perceived the system as "transparent."

Conflicting arguments?

Bailey also takes issue with Shapiro's assertion that the interface plug is too expensive. "Then why are they willing to bear the cost of the circuitry and port that would be needed to decode a national scrambling standard–which is likely to cost a lot more?"

It's clear the two industries are at loggerheads over the issue and that little common ground exists. From the cable industry's perspective, it appears the best-case scenario is that the FCC will agree that flexible scrambling methods are the best way to secure signals and that cable operators will be told to do implement decoders with timers, dual tuners, etc.

The worst thing that could happen is that cable will be told to either cease scrambling, adopt a national scrambling standard or some other single technology, says Bailey. "The Commission has to recognize that perfect compatibility probably is not possible in the short-term." CED

By Roger Brown

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Smart card: A smart idea for cable TV signal security?

At the heart of the rather contentious battle between the cable and consumer electronics industries is a little, credit-card sized matter of signal security: the smart card. How smart is it for signal security applications? Opinions vary all over the map.

Consumer electronics manufacturers see smart cards as the means by which to finally enable full use of built-in TV and VCR features–while still securing cable premium services. Some cable operators, on the other hand, are largely agnostic or downright skeptical about the removable, renewable devices, having been stung many times in the past by nefarious cable pirates.

What is a smart card?

Currently, the term "smart card" is a generic moniker for a card which looks much like the one shown on this page. What makes it "smart" is the fact that, hidden under a web of plastics and epoxies, is a small amount of memory (typically about 4,000 to 8,000 bits) and a microprocessor chip. Connection pins are exposed on the side of the card, which are accessed when the device is slid into a receptacle port.

But it's the location of that receptacle port that represents much of the conflict between some cable operators and the consumer electronics industry. In other words, should the smart card be inserted into a consumer-owned device, or into a cable-owned set-top box?

Under the former scenario, the smart card port would be housed within a television or VCR. This fact alone has some cable operators reeling.

"The fundamental problem here is just what it has always been, and that is, what happens if the smart card is breached?" asks Dr. Walter Ciciora, vice president of technology for Time Warner. "The very idea of 'renewable security' is an honest admission that the security is vulnerable. So, if the security is breached and the cable operator owns it, it's very simple: we replace it. But what happens if the smart card is breached and the consumer owns it?"

What happens, says Joe Van Loan, senior vice president of engineering for Cablevision Industries, is plain and simple: political suicide. "Assuming the consumer owns the security, and assuming it's breached, then only one thing can happen. We have to go back into that person's home and put in a box," Van Loan laments.

Smart card proponents, however, point to many factors which make the card's vulnerability exceedingly tamper-resistant. They are quick to point out, for example, that debit cards (a cousin of the smart card which contains memory but no processing power and is used for banking and telephone access) have been successfully deployed without compromise.

Also, News Datacom, maker of the smart cards used in BSkyB and some 19 other video security installations–including the forthcoming Hughes DirecTv project–submits that in four years of operation over millions of subscribers, their version of a smart card has yet to be compromised. The reason, they submit, is that the device was not designed to be tamper-proof. Instead, it was designed to be highly tamper-resistant, in that its very design creates an "economic disadvantage" for would-be pirates. In other words, by the time a card is duplicated or compromised, a replacement card can be issued which thwarts the theft–and sends the pirate back to a very expensive drawing board.

Economic piracy dis-incentives

George Hanover, staff VP, Consumer Electronics Group of the Electronic Industries Association, calls this an "eco-

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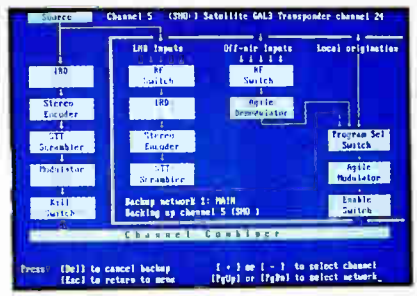

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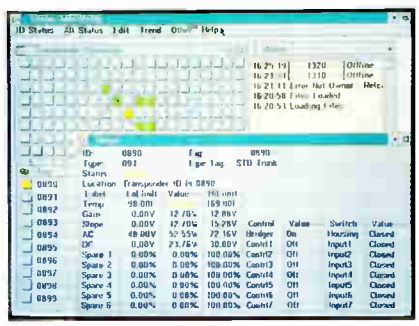

Network Manager controller transponder alarm detail screen.

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nomic dis-incentive" for would-be pirates. "One of the most important security aspects of the smart card is that an address for each particular user is embedded within the memory (of the card). The owner of the card does not know that address," Hanover argues. "Sure, it's possible for some dedicated pirate to reverse-engineer the card. He can take it to a very sophisticated facility and use an electron scanning microscope, and duplicate the IC. But if the cards are re-issued in the event of a breach, the pirate has to go through this whole costly process all over again."

Further, Hanover submits, because smart cards are relatively low cost devices (anywhere from $2 to $15, depending on the amount of memory and degree of microprocessing power), a move to replace the cards wouldn't be financially troublesome for cable operators.

But the arguments don't stop there. Wendell Bailey, VP of Science and Technology for the National Cable Television Association, offers this counter: "The subject here comes down to one thing, and that is, how do you prevent people from finding the lightswitch, or the back door, or whatever you want to call it? In other words, I wouldn't try to crack the algorithm in the card. I'd try to bypass all the handshaking between the box and the card, and find the one pin–and it will be in a data-high or a data-low position–and move it to the appropriate position," Bailey says. "So, I hear their arguments, but they're not very persuasive, because they don't get to the heart of my problem."Further, Bailey argues that citing unbreached cards for debit-type applications, such as automated teller machines, doesn't cut it either. "It's not so easy, in the cold light of day and with a camera on you, to whip out your soldering iron and have at it," Bailey says. "It's an entirely different story when these removable devices can be examined in a private living room with the drapes drawn."

Cablevision's Van Loan refers to this as "mega-tinkering," althou gh he won't take credit for the concept. "What mega-tinkering is, and I find it to be a very profound theory, is the concept of one million people tinkering for one hour.

Some cable operators have serious concerns about the overall security of smart cards.

That kind of tinkering can undo the work of 100,000 engineers working for five years," Van Loan submits.

Reincarnated MultiPort

Enter MultiPort–or, as it is now more fashionably called, the EIA 563 decoder interface. Time Warner's Ciciora sees this as a solution that benefits everyone–well, almost everyone. "We think the EIA 563 decoder interface is a fair and logical approach that's good for the consumer and good for the cable industry, and it's not too awfully bad for the consumer electronics industry, either," Ciciora says.

> "Ultimately, I believe smart cards should be provided by the cable operator and not by the consumer electronics industry."

By using the EIA 563 device, Ciciora submits, both the security system and the signal processing system are replaceable in the face of piracy. "Perhaps an optimal solution would be to have set-tops with smart cards for the older TVs and VCRs and the new, non-feature laden devices. For new TVs and VCRs that have all the fancy features, they would have a 563 plug-in module."

But, says the EIA's Hanover, "if you're going to advocate the MultiPort, then it's very difficult not to see how you wouldn't also be an advocate of (smart card technology) because the card itself contains the intelligence and allows you to change the scrambling system on the fly."

However, Ciciora's concerns relate mostly to an EIA filing to the FCC which states that "the Commission can also explore establishment of a national, renewable security standard, one that would entail decoding within (emphasis added) the consumer electronics equipment and authorization by way of `smart cards' or other new technologies."

If, as many cable skeptics visualize it, decoding and/or signal processing functions are housed within the TV or VCR, a breach is twice as likely to happen. "Security involves two aspects. One is the signal processing, and one is the signal protection method itself," Ciciora says. "The would-be pirate will attack the weaker of the two. So, it's important that both parts be replaceable–not just the encryption part, but the part that actually processes the signal."

To that end, Ciciora and others feel that a possible solution may be to proceed with smart card evaluation–but in the set-top, not the TV or VCR. "Let us not forget that pirates are very clever, and we make over 20 million TV sets a year," says Vito Brugliera, VP of marketing and product management for Zenith Electronics. "A good solution may be to develop a set-top terminal of some kind, where the decoding and conditional access functions are in the card. That way, if the cable company owns the box, it at least has the option of retrieving boxes and changing them out, if ever they are compromised. They don't have that option if the consumer owns the device."

Alternate theories

Graham Stubbs, an independent consultant specializing in signal security systems for cable television operators, has a different theory altogether. "I believe the MSOs and the program providers should get together and set out what the security needs of future systems are. I don't believe they should simply leave it to the vendors," Stubbs says. "Ultimately, though, whatever the smart card looks like, I do believe it should be provided by the cable operator and not by the consumer electronics industry."

Paul Resch, director of engineering for TVN (formerly of The Disney Channel), says he's a fan of smart cards. "I think they make sense," Resch says. "Think about it: Banks aren't perfectly secure; people still rob banks and get away with it quite well. The question is, where do you draw the line?"

Unless a cable operator is willing (or is forced by law) to experiment with the cards, we may never know. CED

Leslie Ellis

CED is so important to me...I had it forwarded right away.

David M. Fellows
Senior Vice President
Engineering and Technology
Continental Cablevision

21st century technology—now

Global satellite system for signal leakage

The purpose of this article is threefold: To provide information about the current relationship between CATV and GPS; point out similar expressions and terms that are interchangeable; and provide information about policies and technical data which will influence the cable industry in the future. Because previous trade articles have been written on GPS history and theory, this paper will try to avoid repeating or recycling old material.

Introduction

GPS is a satellite-based radionavigation aid deployed by the U.S. Department of Defense that is primarily aimed to support the military. However, GPS is also made available for use by the general public and commercial entities to obtain accurate positioning.

In February 1993, the 18th "block-two" satellite was set into orbital plane B-1. There are now 22 block-one and block-two satellites in orbit out of a scheduled 24. Six launches are scheduled for 1993, which will complete the constellation and begin phasing out the older block-one satellites. For the first time in history, 24-hour three-dimensional coverage is possible. There are absolutely no lapses in two-dimensional coverage now.

Also, newly completed GPS algorithms are making constellation jumps, where a segment of the plotted course jumps to one side or the other (see Figure 1), a thing of the past. Jumps occur when a GPS receiver tracks different satellite constellations as they become visible. These jumps, when combined with selective availability (S/A) errors, can produce a messy course on a digital map. Multipath errors are still a problem, but they occur significantly less frequently and are usually single points instead of a segment.

Maintenance concepts

Let's back up and look at two concepts that are fundamental to CATV service: Demand maintenance (D/M) and preventive maintenance (P/M). D/M is reactive—which results in a random pattern, like outages and priority service calls. It doesn't matter what part of town they occur, the course of action is to "Drop what you're doing and proceed immediately to that new location." The other side of the coin is P/M, which is methodical and well planned. A tech could have 25 service calls, 20 amps to sweep, 30 leaks to fix, or 100 miles of plant to ride out, but his day is planned ahead of time, which is more efficient. A tech may have to respond to an outage, but he will return to his P/M duties.

GPS has two categories that correspond with the D/M and P/M formats: Real time and post processing. The idea of real time GPS is to supplement beepers and two-way radios with fleet management. The idea of post processed GPS is to enhance the productivity of P/M by streamlining the planning.

Surveyor accuracies

First, let's talk about how surveyors achieve accuracies of just a few centimeters. A sophisticated GPS receiver will measure not only the pseudoranges (code), but also the carrier phase. Utilizing differential techniques, the carrier phase yields centimeter precision compared to meter level precision offered by the pseudoranges. The carrier phase measurements are made ambiguous by an unknown integer number of carrier cycles–the so-called "carrier phase ambiguity."

This carrier phase ambiguity remains constant over time as long as the receiver is phase-locked to the incoming signal. No similar ambiguities exist for the pseudoranges. If we can correctly identify the carrier phase ambiguity number, we can convert the carrier phase measurements into very precise range measurements. This integer ambiguity resolution is the goal behind several different post processed procedures, including: static differential positioning; pseudo-kinematic surveying; stop-and-go surveying; and rapid static surveying. While a detailed discussion of these procedures is beyond the scope of this paper, the concept to remember is the difference between pseudorange (code) and carrier phase

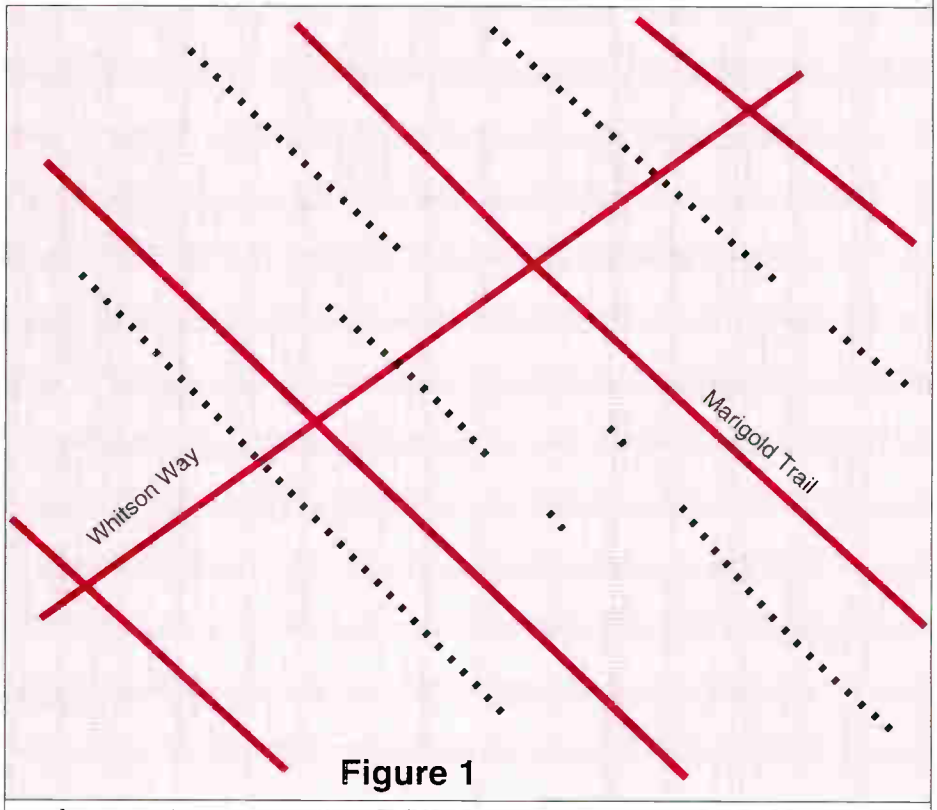


Figure 1

By Ken Eckenroth, Vice President of Engineering, Cable Leakage Technologies

receiver abilities. The terms pseudorange and code are interchangeable in this application. All GPS receivers interpret code, but only high-end GPS receivers interpret code and carrier.

Time concepts

The next concept is the difference between GPS time and UTC (universal coordinated time). UTC time is measured in seconds and is referenced to the London time zone. This time zone is not to be confused with the absolute longitude coordinates 0 degrees 0 minutes 0 seconds, which runs north and south through London. This time zone encompasses the United Kingdom. GPS time is a product of a satellite's atomic clock, with nanosecond accuracy. A sophisticated GPS receiver would utilize this in time transfer technology, which is an entirely different field.

How does the FAA (Federal Aviation Administration) plan to use GPS? The answer falls into two categories: Accuracy and integrity. Civilian GPS, or SPS (Standard Positioning Service), has a stated accuracy of 100 meters (95 percent of the time). This is acceptable to the aviation community for en route and non-precision flight operations, but not for airport precision approaches. Three technical approaches for accuracy are under study—differential GPS; augmenting GPS signals with other navigation aids (top candidates are GLONASS [Russian GPS], Loran-C, and inertial navigation systems); and real-time kinematic carrier phase tracking.

The challenge here is to take this centimeter accuracy beyond the stationary mode and develop methods for dynamic civil aviation operations (ambiguity resolution on the fly). There is a new technique that shows great promise. It's called "widelaning the dual frequencies" and is solving the ambiguity resolution in 1 to 3 seconds.

GPS at this time cannot meet the FAAs' requirement for integrity. This is the ability of the system to provide timely warnings to the user when the system should not be used for navigation. These integrity requirements are 30 seconds for en route flights, 10 seconds for terminal areas and non-precision approaches, 6 seconds for certain precision approaches, and 1 to 2 seconds for precise approaches leading to actual runway touchdowns.

Minimum Operational Performance Standards (MOPS) set by a Washington-based commission, which affect aviation on a global scale, are calling for the 10-second integrity warning. Inmarsat is proposing an integrity channel via it's 3rd-generation satellites beginning in 1995. It would uplink in C-band and downlink in L-band frequencies adjacent to GPS frequencies. This is called the Bent Pipe effect.

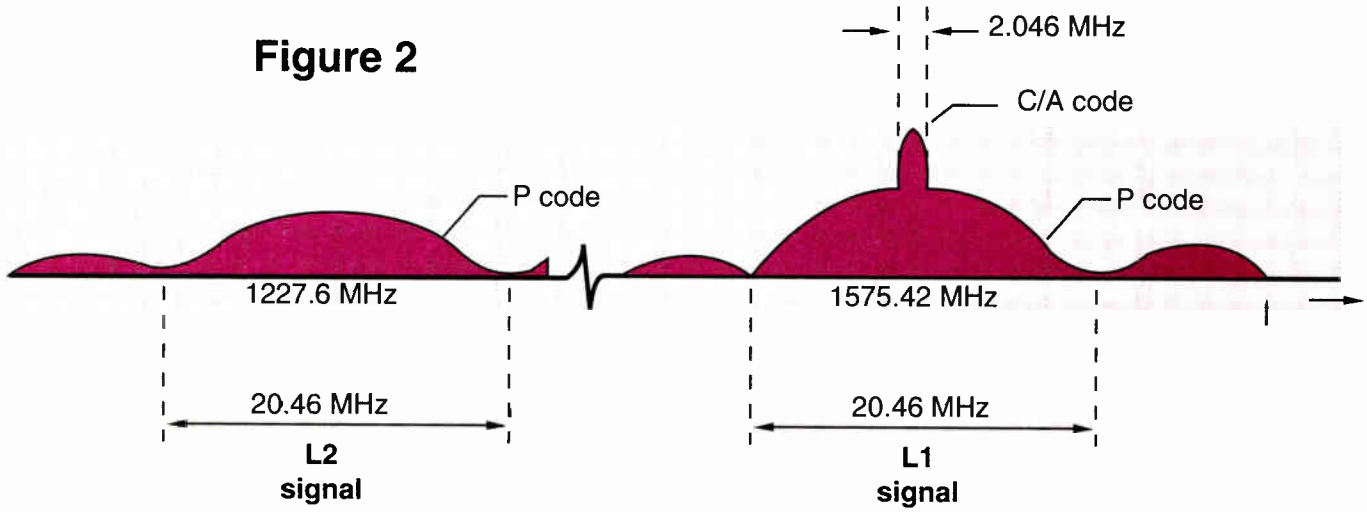
When one is dealing with something as critical as integrity, the question, "What if there is a total failure of the system?" must be asked. RAIM (receiver autonomous integrity monitoring), which would choose between other augmented systems seems to be the conventional answer. The GPS process for aviation is evolving toward a GNSS (global navigation satellite system).

Horizontal accuracies

Horizontal accuracy is a subject that does apply to cable operators. Government-stated specifications for SPS (civilian) is 100 meters (95 percent of the time) with S/A on; PPS (precise positioning system) or military spec is 18 meters (95 percent of the time). This 95 percent spec is a huge cushion. Realistically, it's more like 99.5 percent. Every once in a while you'll see a huge jump that probably only the Dept. of Defense could explain. S/A does not affect the PPS. So, does the PPS represent what the civilian service would look like if S/A was turned off?

Remember, PPS is a product of the P code placed on both the L-1 and L-2 frequencies (see Figure 2). The dual frequencies allow the receiver to correct for ionospheric errors. The higher frequency will have a greater loss. The difference can be measured to determine the ionosphere loss. The C/A code is only on the L-1 frequency. Single frequency signal processing incorporates a mathematical model called the Klobucar model. This eliminates half the ionosphere errors but not all of them.

There's another error that is the product of S/A, called the "observables." These are the satellites that are in view for the individual GPS receivers when making differential corrections from a base station to a rover receiver. There may be, for example, eight satellites in the sky over an immediate area. The base station GPS receiver may see all eight



C/A code = civilian code = SPS = single frequency
P code = military code = PPS = dual frequency
S/A = clock dithering affects C/A code measurement
A/S = P code is encrypted to Y code
S/A corrective action = differential GPS
A/S corrective action = military encryption keys

while the rover may see only seven. This is because buildings and other obstructions may block the view of the rover. The percentage of observable error is the combination of how long an obscured satellite (for the field unit) is on the horizon and whether or not S/A is cranking on that satellite at that time, and whether a leak (event) occurs at that time.

Consequently, each receiver has its own unique navigation solution (prime course). This means that if (up to 100 meter error causing) S/A were removed, accuracy is slightly worse than 18 meters because half of the ionospheric error still exists for a single-frequency GPS unit.

Those who have ever seen a plotted course on a digital map with S/A working know that the goal is to be on the right street. Most streets are 300 to 400 feet apart. That means accuracy of 150 feet or less would be sufficient to put the path on the right street. When you're dealing with the integrated navigation solutions (latitude and longitude) instead of the raw data (pseudoranges, range rates, etc.), S/A's effect is quasi-directional. The plotted course could be up to 300 feet above, below, left, or right of the actual prime course. Integrated differential corrections would produce a spec in the neighborhood of 25 meters (99 percent of the time because of the observables and multipath errors). Remember, these are worst case numbers and the norm would be 15 meters (street width accuracies).

There is a way to get this type of accuracy by using differential GPS receivers. The most accurate and expensive models produce 2- to 5-meter accuracy, but because they work with GPS raw data, they work in real-time only. The differential systems which utilize integrated solutions are more reasonably priced and work in the post processed realm. Consumers will buy the accuracy that applies to them. That's why it's important to understand all the facts.

Government policy re: S/A

There is another way to remove S/A, and that is to simply turn it off during peace time. S/A at one time was degrading GPS accuracies to 500 meters (95 percent of the time). The Cold War threat of missiles being locked onto the signal was a real concern. In 1983 the Department of Defense reduced accuracy to 100 meters. Additional emphasis was placed on the civil use of GPS after the downing of flight KAL 007 by the Soviet Union. The Senate, after condemning the act, called for a speeded up timetable because GPS benefits public safety.

In this context, maybe the S/A error should be tied directly to defense conditions. Zero or minimum threat should equal no S/A. Medium threat would equal medium S/A, and so on.

Anti-spoofing

Anti-spoofing (A/S) is another product of the DOD that provides military protection against fake signals. A/S works by encrypting P code to Y code. P code is commercially used by civilians, but only military personnel have the Y code encryption keys (see Figure 2). It's important to understand the difference between S/A and A/S in the fact that A/S does not affect the average civilian GPS user. Most people familiar with GPS would say S/A is here to stay. However, there are many who believe the DOD is doing the American taxpayer a great disservice by operating S/A during peace time. CATV is now part of the long list of industries affected by the operation of S/A.

Conclusion

GPS technology promises some amazing things to different consumer groups. Unfortunately, some of these groups will have to wait for some answers. Fortunately, one of these groups isn't CATV. CED

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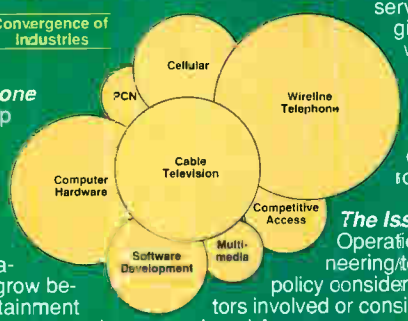

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Pre-Conference Tutorial: On May 12, CommPerspectives in conjunction with Hatfield Associates, Inc. will hold a one-day tutorial titled Understanding Telecom Technologies for the Cable Television Professional. For information and registration forms, return the coupon below or call 303/393-7449 and ask for Jayne.

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Circle Reader Service No. 24

Ad insertion in the digital age

Since the advent of advertiser-supported cable channels, cable operators have sought ways to gain a larger share of the national spot ad market, a golden egg estimated to be worth billions of dollars per year. Cable companies have largely missed out on this segment of the television advertising market because the industry was too fractured for media buyers to effectively cover entire markets without contacting several systems and coordinating purchase efforts.

What the cable industry needed to participate was a central, coordinated effort and delivery mechanism to make the thousands of cable systems located across the country easily accessible by ad agencies.

Leading the charge toward this coordinated effort is Cable Television Laboratories. At the end of 1991, CableLabs created a Compressed Digital Commercial Insertion Task Force to explore the feasibility of using digital video compression techniques to efficiently transmit spot ads directly to cable headends electronically.

Initially, the Task Force met and framed out the business and technical issues associated with making the nation's cable systems a single, homogenous unit. Most of discussions revolved around the use of interoperable technologies, according to Scott Bachman, vice president of operations technologies projects at CableLabs.

A shift to digital

"Ad insertion is a connectivity business" that needs an infrastructure similar to the one needed for systems to become two-way interactive, Bachman said. Therefore, it was important for the Task Force to focus on the development of an open architecture that allows for proprietary products to be manufactured.

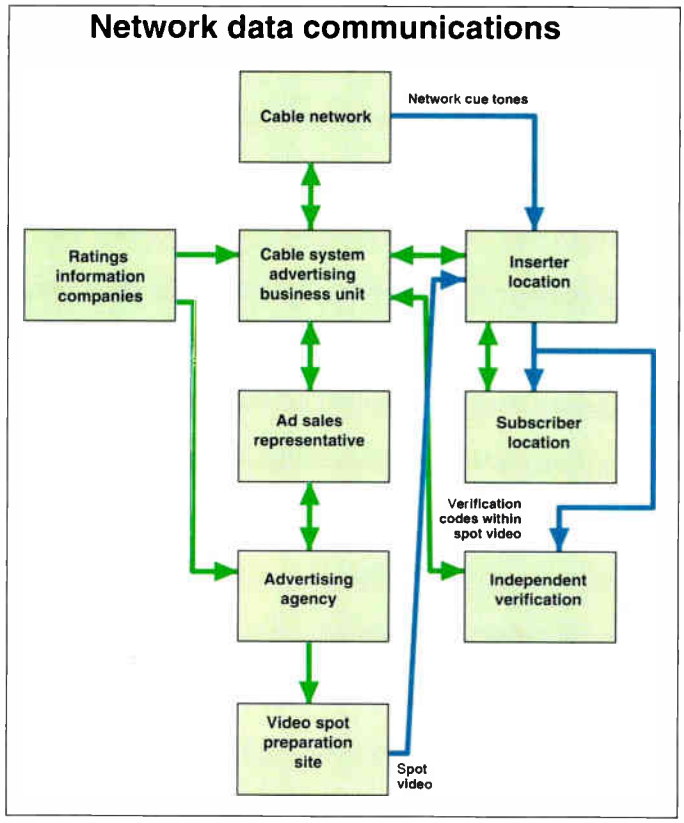
Along with providing ad agencies a simpler method of purchasing, the shift to a digital delivery method was seen to potentially benefit operators in other ways, said Bachman. In the digital domain, cost structures shift (the most expensive hardware is shared by multiple users in a region), ad quality improves because there are no generational losses when spots are copied, costs are reduced because there's no need to make hundreds of video tapes, and advertisers can accommodate last-minute schedule changes because turnaround time is minimized.

The Task Force, which was made up of sales, business and technology leaders in the ad insertion business, became the Advertising Technology Task Force in 1992 in recognition that issues other than digital video compression needed to be taken into account to build a comprehensive communications architecture.

The Task Force generated a "white paper" entitled, "Cable Ad Sales, Business Goals, Objectives, Strategy and Technical Vision" in September 1992. This 88-page document describes ad sales history and present practices; identifies strategic business directions; and gives a description of the interfaces that will be for the entities involved to "talk" to one another.

For example, the Task Force's document described the necessary technology platform as an "integrated, multi-market, multi-level electronic highway." This highway, according to the Task Force, should feature: secure data streams; an "open" network architecture; a standard internetworking protocol, such as X.25; support of multiple video delivery formats; and an applications protocol that is flexible and extensible.

The concept is embodied in what CableLabs calls the "Cable Ad Control Network," which, from a national perspective could be thought of as a "bridge" between different providers of hardware and software systems. In essence, the control network is a unified set of protocols and interface descriptions that make it possible to send information down a network.



This chart is one example of how data could be transmitted nationally for spot advertising. The concept allows for proprietary system elements to exist on a common platform.

Next step: field trials

Ad insertion hardware manufacturers are scurrying to develop and test equipment that will meet the needs outlined by CableLabs, MSOs and interconnects. Among the players are StarNet, Multivail, SkyConnect, Channelmatic, General Instrument, Scientific-Atlanta and others. Several field tests of new equipment are slated to occur later this year.

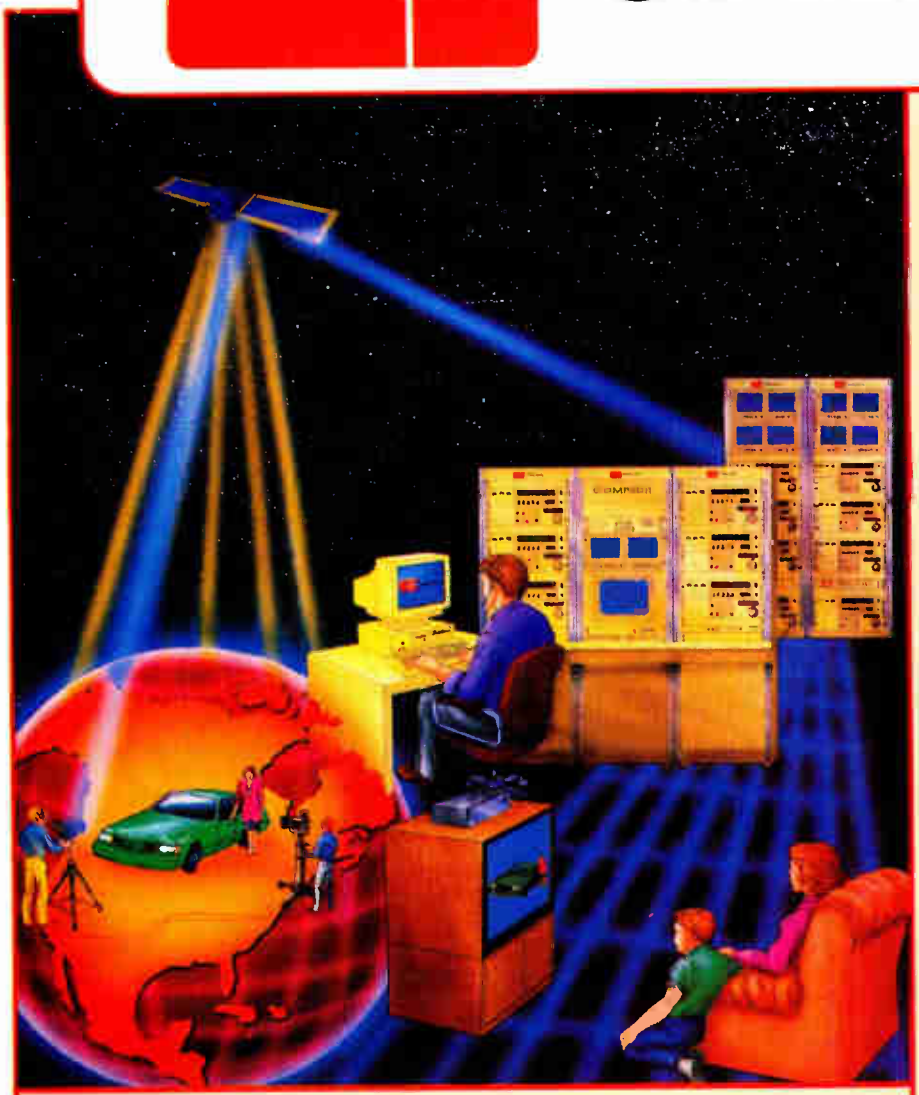
In the meantime, several operators have said publicly that they're holding off purchases of new equipment because the marketplace is so poised for change.

Now that the needs of the cable advertising industry have been laid out on paper, the Task Force will concentrate its efforts on three key areas, according to Bachman. First, the group will nurture the development of protocols and publish guidelines; next, field trial programs designed to demonstrate the ad control network will be announced and monitored; and efforts to "microtarget" ads to small neighborhoods or communities will be designed.

This microtarget concept is similar to the "narrowcasting" that is made possible by installing hundreds of fiber optic "nodes" throughout a cable system. Doing something similar in advertising would make it possible for advertisers to, say, target an ad in Chinese and direct it to the residents of San Francisco's Chinatown, Bachman said. CED

By Roger Brown

CHANNELMATIC



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May 4 *Mid-South Chapter* To be held in Memphis, Tenn. Installer exams to be administered. Call Bob Allen, (901) 365-1770, ext. 4110.
May 4 *New Jersey Chapter* Installer exams to be administered. To be held in Toms River, N.J. Call Linda Lotti, (908) 446-3612.
May 5 *Penn-Ohio Chapter* Installer exams to be administered. Call Marianne McClain, (412) 531-5710.
May 5 *Ozark Mountain Meeting Group* To be held at the Executive Inn, Springdale, Ark. Call Lyle Weimer, (501) 524- 6869.
May 6 *OSHA/Safety Seminar* "Training Seminar for System Managers and Safety Coordinators in Maintaining Records and Developing Safety Training Programs." To be held at the Hilton Plaza Inn, Kansas City, Mo. Call SCTE headquarters, (215) 363-6888.
May 6 *Chesapeake Chapter* "Cable Technology for Non-Technical Personnel," to be held in Arlington, Va. Call Scott Shelley, (703) 358-2766.
May 6 *New Jersey Chapter* "Test Measurement Practicing" and BCT/E exams to be administered in all categories, both levels. To be held at the Wayne Holiday Inn, Wayne, N.Y. Call Linda Lotti, (908) 446-3612.
May 6 *Rocky Mountain Chapter* BCT/E exams to be administered in all categories at both levels. Call Ron Upchurch, (303) 790-0386, ext. 403.
May 10-11 *Bluegrass Chapter* "Installer/Tech Troubleshooting," with Billy Grubbs and Jack Wheeler, "Outage Prevention Control" and "FCC New Legislation" with Roy Ehman. BCT/E exams to be administered in all categories at both levels. Call Alan Reed, (502) 389-1818.
May 11 *Desert Chapter* Installer and BCT/E exams to be administered in all categories at both levels. To be held at Southland Cablevision, Redlands, Calif. Call Doug Williams, (619) 340-1312, ext. 277.
May 11 *Magnolia Chapter* "Satellite Antenna Retrofit and Troubleshooting" with Brian Wilkes of Rainbow Satellite, and "Digital Compression" with John Vartanian of HBO. To be held at the Ramada Coliseum, Jackson, Miss. Call Steve Christopher, (601) 824-6010.
May 11 *New York City Chapter* "Public Relations, Regulatory and Engineering Joint Venture" with Don Helms of Teleport Communications Group. To be held at TCG, Staten Island, N.Y. Call Rich Fevola, (516) 678-7200.

PHILIPS

Philips Broadband Networks has announced its mobile training schedule for the month of May. In the training, designed for operators and field technicians, classroom instruction is combined with hands-on training to help attendees learn about basic concepts and advanced theories. Course content consists of RF and video distortions, headend basics, amplifier applications and operation and record-keeping/maintenance. The agenda also includes courses on interdiction methods, PCN & system architectures.
May 4-6 *San Francisco, Calif.*
May 11-13 *Portland, Ore.*
May 18-20 *Bellingham, Wash.*
For more information on the training or to register, call (800) 448-5171 (in New York state, call (800) 522-7464).

TRADE SHOWS

May 2-7 *Conference on Lasers and Electro-Optics (CLEO)* Sponsored by the Optical Society of America. To be held in Baltimore, Md. Call (202) 223-9034 for more information.
May 10-12 *Canadian Cable Television Association Cablexpo* To be held in Toronto, Ontario. Call Christiane Thompson at (613) 232-2631.
May 12-14 *Convergence '93* To be held in Denver, Colo. Call Terri Sinner at (303) 393-7449.

The CABLE POLL

Midwest CATV • CED • Cablevision

Most ops advertise on just three to five channels

It comes as no big surprise that most cable operators (62 percent) are using advertising insertion equipment to tap into alternative revenue streams.

What is surprising, however, is the fact that only 16 percent of the GMs surveyed in the most recent edition of the Cable Poll are inserting ads on more than eight channels–a statistic that will have to grow if cable's ad community wants to move toward a national ad interconnect.

Indeed, most of the GMs polled (40 percent) submit that ad insertion equipment is currently utilized on three to five cable channels. Another 28 percent say they run ads on five to eight channels; 16 percent insert on one or two channels.

A weighty 38 percent say they need ad insertion hardware before they can effectively break into the cable ad business.

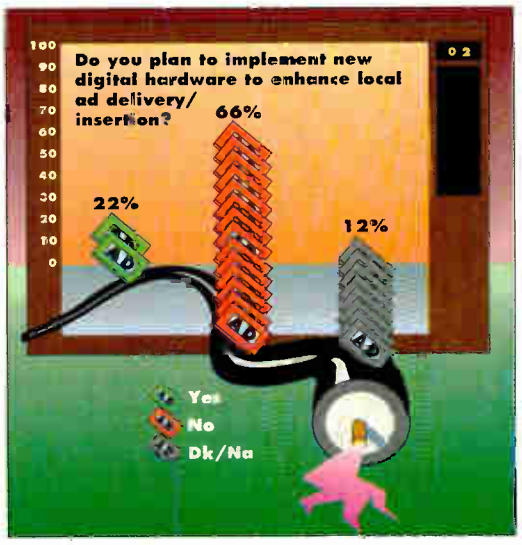
One-third point to a lack of enough advertisers to make a profit for their current ad insertion emphasis. Another 21 percent say the ad insertion business is simply too expensive to handle, presumably referring to the production of professional-looking ads and VTR maintenance.

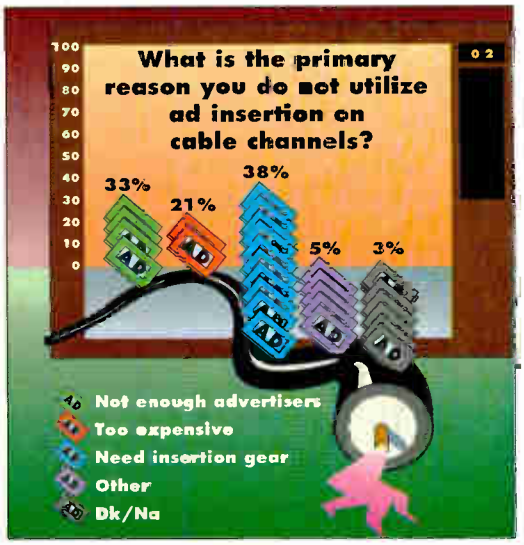
Digital not a priority

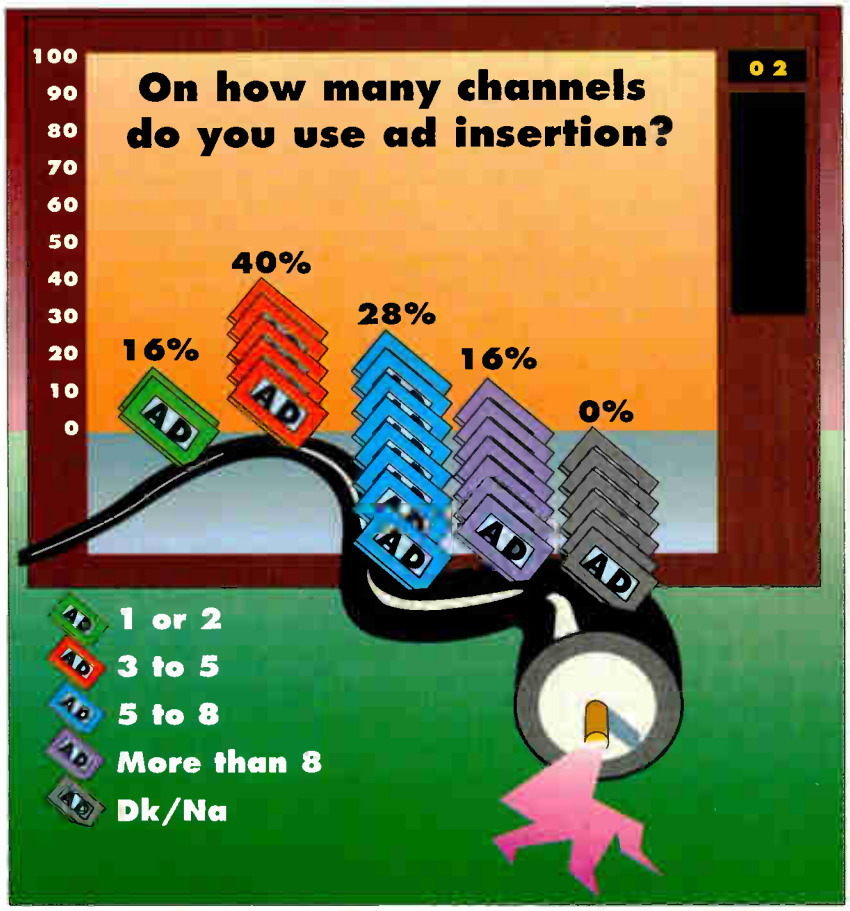
The digital future doesn't appear to be a high priority for cable's GMs. A resounding 66 percent admit they're not actively planning to implement new digital hardware as a means to augment existing gear.

However, 22 percent say they are planning to implement the digital advancements being proposed by cable's ad insertion manufacturers. CED

By Leslie Ellis







You say you want a big screen?

CERRITOS, Calif.–**Advanced Digital Systems Inc.** has announced a new PC-to-video convertor, called the "VGA to TV Elite," designed to transfer images from a personal computer to a big-screen TV or VCR. What makes the unit different from similar devices, ADS officials submit, is its price: $399.

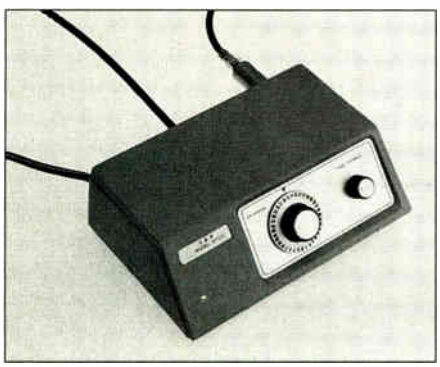
The unit was designed as a presentation tool for educators, trainers and other PC users looking for a means to present computer graphics, text or other computer applications on a big-screen television (or, they submit, to simply play computer games on a larger screen).

The Elite system is compatible with any VGA card, and supports resolutions of 640x480 and up to 16.7 million colors. Users can use their VGA monitor and television simultaneously, and additional features such as brightness control, chroma-lock and auto-TV blanking are also included. Circle Reader Service No. 29.

Signal security devices

E. SYRACUSE, N.Y.–Three new products have been announced by **Communications & Energy Corp.** First is its Chan-L-notch, a new line of channel deletion filters available through channel 61 (444 MHz-450 MHz). The "brick wall"-type bandstop filters, officials say, delete a channel for reuse while leaving adjacent channels in service. NTSC, PAL, offset and inverted versions are available, and prices start at $650 (depending on channel desired).

Communications & Energy Corp.'s Chan-L-notch.



Communications & Energy Corp.'s UV500 UHF-VHF decoder.

Also new from Communications & Energy Group is its "Zap and Trap" line of positive encoders, designed to scramble CATV premium channels. The line includes models for both U.S. and PAL IF frequencies, as well as models for scrambling the RF channel directly.

And, Communications & Energy has announced its UV500 subscriber decoder, designed for UHF-TV premium channels scrambled with its positive scrambling (jamming carrier) system. The unit is designed for use in LPTV over-the-air pay-TV systems transmitting on UHF channels, or in European CATV systems (which often include online UHF channels).

The unit works by converted a subscriber-selected UHF channel to a specific VHF channel for decoding by an internal or external decoding trap. For example, the unit could exit the decoded channel on channel 3, and a standard channel 3 decoding trap can be attached. The unit is also available with an internal decoding trap. For more information, circle Reader Service No. 30.

Fiber optic power meter

Fotec's M310A fiber optic power meter.

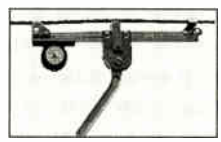
BOSTON–**Fotec Inc.** has announced a new fiber optic power meter line that bridges both field service and laboratory measurement requirements, officials submit. The unit, called the M310A, includes a user-friendly front panel and a built-in intelligent interface which enables communication with a computer for any laboratory measurements needed. It is calibrated at 850 nm, 1300 nm and 1550 nm for LAN, telco and CATV applications.

According to Fotec officials, the unit's microprocessor-based memory and digital signal processing technology uses fewer than half as many components as in previous designs while offering higher performance and greater flexibility.

The M310A offers user-selectable readout resolution, with measurements of either 0.1 dB (for field testing) or 0.01 dB (for laboratory testing) resolution. Two front panels enable selection of calibration wavelength and measurement range. The computer interface includes Fotec's "FOtest" software and interface cable to control all meter functions and data logging, where the M310A acts as an intelligent terminal and the FOtest software provides simple communications. The M310A is available from Fotec for $995.

For more information, circle Reader Service No. 31.

Strand tensionometer



GMP's strand tensionometer.

GMP's guy strand ratcheting cable cutter.

TREVOSE, Pa.–New from **GMP** is a strand tensionometer, designed to measure the tension of 1.4-inch through 7/16-inch guy wires and messenger cables to assist in the compliance with revised NESC Uniform System of Clearances.

The dynamometer measures the force required to deflect the strand to an out-of-line position. It registers this force on an integral, calibrated dial which can then be converted into a tension value on a calibration chart.

Also new from GMP is a guy strand ratcheting cable cutter, designed to provide two to three times more cutting power than conventional cutters, GMP officials submit. The new tool cuts EHS or utility-grade guy strand, bolts or rods up to 7/16-inch in diameter. The key to its strength is a variable-force ratchet drive which powers a large cutting head made of 4140 alloy steel.

For more information, circle Reader Service No. 32.

Digital impulse noise reducer

STAMFORD, Conn.–New from **Intelvideo Inc.** is its INR digital impulse noise reducer, a signal processing system designed to remove electrical or ignition-type impulse noise from NTSC color signals. The unit is also effective in detecting and correcting satellite or FM link threshold noise that normally appears as "sparkles" or streaks, officials say.

Aside from standard analog-to-digital and digital-to-analog conversion operations, the system's signal processing is all digital, in that every video pixel is analyzed and a differentiation between video and noise is made based on the statistical characteristics of unwanted noise and errors. Circuits are used to analyze

the video signal and search for impulse noise and dropout errors, using multi-dimensional correlation techniques.

When the circuits sense that a particular video pixel has noise perturbation or is in error and motion circuits determine that there is no motion in the vicinity of the error, that pixel is replaced with a value that is predicted from spatio-temporal neighboring pixels. All signal processing is performed on the composite color signal, officials submit, so that video impairment introduction attributable to color decoding and encoding is avoided.

For more information, circle Reader Service No. 33.

Miniature OTDR

UTICA, N.Y.–New from **Laser Precision Corp.** is its TD-1000 miniature OTDR, a handheld and dual-wavelength mini-OTDR designed to characterize both short-haul and long-haul fiber optic cables.

The unit contains a 3.5-inch disk storage capability for documenting fiber optic cables, and an integral power meter for measuring output power of fiber optic transmitters. Dynamic range of the unit is 26 dB; both single and versions are available. For more information, circle Reader Service No. 34.

Rental video training

ENGLEWOOD, Colo.–**Mind Extension Institute (ME/I)** has announced that four of its award-winning interactive video training courses have been packaged so that they can now be rented for as little as $30/month, per employee, ME/I officials say.

The rental courses include: "Customer Service: Your Key to Success," "Sales Through Service," "Installer Training" and "General Safety." The titles had previously been available for purchase only. Rental packages include the program software, laser videodisc player, supervisor's handbook and student workbooks.

The four courses included in the rental program each qualify for recertification credits from the Society of Cable Television Engineers's BCT/E certification program.

For more information, circle Reader Service No. 35.

Improved ground connector

CARTERSVILLE, Ga.–**Sachs Communications** has announced an improvement to its SC42 ground connector, designed to bond cable television #10 through #14 AWG copper ground wire to the ground conductor of the premises. Improvements of the connector include what Sachs calls "universality," in that the ground connector now handles either a #4 or a #6 AWG ground conductor equally well, eliminating the need to stock two different sizes.

Sachs has also enhanced its SC12DN series of UL-listed grounding blocks. Improvements include a new locking tab, designed to hold the 81-type connector for single wrench installation. An oval through-slot permits upgrading with a wide variety of 2-, 3- and 4-way splitter brands, Sachs officials submit. The ground wire connector is made via an "insert and wrap" bridge assembly.

For more information, circle Reader Service No. 36.

Fiber organizer, identifier

Siecor's CheckPoint fiber identifier.

HICKORY, N.C.–New from **Siecor Corp.** is a modular fiber organizational system (called the FOS FDF) that enables users to design a flexible fiber optical cabling system within a cable TV headend that is expandable to accommodate upgrades and other rearrangements.

The system is modular, so that it can be used as and interface between outdoor and equipment cables in a fiber system. It can be used in either a cross-connect or an interconnect capacity for singlemode cable systems.

Also new from Siecor is its CheckPoint fiber identifier, a self-contained installation and maintenance tool that safely detects the fiber path and transmission direction without disrupting service.

According to Siecor officials, the CheckPoint can identify which fibers are carrying live traffic, a 2 kHz pulsed signal or no signal at all via a non-destructive macrobend technique that does not interrupt normal service or compromise fiber integrity. The device is particularly useful when identifying specific fibers prior to splicing during installation, branching, rerouting or live cutovers, officials submit.

For more information, circle Reader Service No. 37.

International receiver

Standard Communications' MT900 Intercontinental satellite receiver.

LOS Angeles–New from **Standard Communications** is its MT900 Intercontinental satellite receiver, designed for use in broadcast, SNG, special network and cable television applications. The receiver uses a 950 MHz-1750 MHz RF input with dual conversion to a 70 MHz final IF. It can be used to rebroadcast anywhere in the world, officials submit, from almost any satellite format. A video standard switch alters the video de-emphasis, clamping and low-pass filter for 525 NTSC and 625 PAL/SECAM TV line rates, and an RF PLD permits IF turnarounds between satellite bands.

Also new from Standard is its Omni Global VU (Model CAM830), an access control module designed to bridge the gap between multiple menu-driven receivers and simple rotating analog knob receivers. The system was designed for the Agile Omni MT830 and MT830I receiver systems, and enables, front panel control and access to re-programming of all of the Omni's functions.

An unlimited number of user-definable satellite formats, complete control of all three audio subcarrier demodulators and control of international video features such as NTSC, PAL and SECAM are supported in the module.

For more information on either of Standards new products, circle Reader Service No. 38.

Fiber optic cable enhancement

RESEARCH TRIANGLE PARK, N.C.–**Sumitomo Electric** has announced that its Lightpipe single tube cable now includes a protective Armorlux sheath, making the cable more rugged in harsh environments. Also, the company has announced the addition of two extra ripcords next to the steel wire strength members, and a new flexible buffer tube. The ripcords, Sumitomo officials submit, were designed to speed cable-end and mid-span entries, while the flexible central buffer tube enables easier cable handling in splice closures.

For more information, circle Reader Service No. 39. CED

Compiled by Leslie Ellis

RETURN PATH

The SCTE

The Society of Cable Television Engineers now has more than 10,000 members and just completed its annual Cable-Tec Expo in Orlando, Fla. This month, we'd like your thoughts about SCTE and its value to you professionally.

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

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

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

	Yes	No	Don't know
1. Are you a member of a local SCTE chapter or meeting group?			
If so, which one?			
2. If you answered yes to question 1, how long have you been a member of SCTE?			
3. How many meetings does your chapter have in an average year?			
4. How many meetings do you personally attend per year, on average?			
5. Does your management encourage you to attend SCTE meetings on a regular basis?			
6. Does your management reimburse your expenses related to these meetings?			
7. Do you find these meetings helpful to you professionally?			
If so, why? If not, why not?			
8. What technology subject areas would you like more information about?			
9. Did you vote in the last SCTE national election?			
If not, why not?			
10. Have you ever served as a local chapter officer (president, VP, secretary, etc.)?			
11. Are you enrolled in the SCTE BCT/E or installer certification program?			
12. Does your employer provide a financial incentive for employees to become SCTE certified?			
13. Would you recommend others to become members of SCTE?			
14. What do you think is the greatest benefit you derive from being a member of SCTE?			

Please provide the following information:

Your title_____

Your job function (ie. engineering, technical, etc.) _____

The size of your system (# of subs) _____

The length of your CATV career (years) _____

The state in which you work _____

Your MSO (optional) _____

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CHIEF TECHNICIAN

Telescripps Cable Co. of Greater Bluefield, WV, is seeking an individual to supervise technical department of 15,000 subscriber system with 300 miles of plant. Position involves management of two headends using 300 MHz S.A. electronics as well as directing technical staff of ten. Qualified applicant must have headend and overall system maintenance experience. Must have knowledge of FCC regulations, CLI, performance testing, test equipment, system sweep, and construction. Electronics background helpful. Must have demonstrated ability to supervise and be able to handle administrative duties. Excellent benefits package. Great opportunity for advancement. Mail resume and salary history to:

Regional Engineer
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Colony Communications, a top 20 MSO, has an immediate need for a Technical Training Manager to work in its Providence, RI headquarters.

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Colony Communications, Inc.
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CHIEF ENGINEER

Progressive telecommunications operating company in Oregon's Willamette Valley is seeking a motivated self starter to manage all phases of the technical portion of our business. We provide telephone, CATV, and data service, and are taking a leading position in deploying SS7, Class, and fiber in the trunk, feeder, and loop. The individual we seek should have significant experience in supervision, engineering, and operations, plus good communications and presentation skills. Licensed engineer preferred. Familiarity with REA procedures, regulatory and revenue requirements issues, and CAD mapping a plus. Excellent salary and benefits. Reply with resume and salary requirements to ***Jack Pendleton, PO Box 230399, Portland, OR 97281-0399*** by mm/dd/93.

FIELDERS, DESIGNERS, DRAFTERS (CATV)
Nationwide communications contracting firm based in Columbus, Ohio, has immediate need for experienced CATV Fielders, Designers and Autocad Drafters. Design & Drafting positions are located in our Columbus office. Field opportunities are Nationwide. Please send resume with salary requirements to: **NaCom, Director of Personnel F/D/D, 1900 E. Dublin-Granville Rd., Suite 100A, Columbus, OH 43229.** ***EOE M/F/H***

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To apply, forward inquiries and vitae to:

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Aggressive cable company is searching for a degreed engineer. Must possess 2-3 years assistant engineering experience that lends itself to construction and some cable design. We are seeking an aggressive individual who is young and has no apprehension about constant travel. Position will be compensated in the low 30's with a full benefits package.
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TECHNICAL OPERATIONS ADMINISTRATION

National hospital television network seeks technician with excellent communications skills, strong management potential, and demonstrated background in MATV-CATV, data, and bi-directional cable. Knowledge of hospital technical environments a plus. Young, innovative company. Excellent benefits, some travel. Reply with resume, salary requirements and letter to:

TNC Group
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ENGINEERING/DESIGN/CONSTRUCTION

EQUIPMENT MARKETPLACE

Polska Telewisza Kabelowa S.A.

Just try to imagine, in 1988, the roadblocks and even personal perils likely to confront the organizers of a cable TV network in communist Poland, under martial law since 1981. Yet that is exactly what Andrzej Muras set out to accomplish, nearly a year before Lech Walesa's Solidarity movement won the first free elections in a Soviet bloc nation since 1940.

Muras was technical director of Polish Television. He learned about cable TV in the United States during a visit from Bill Sinkunis, an active participant in American cable TV whose wife has roots in Krakow. Recognizing the potential for cable TV in Poland, Muras and Sinkunis succeeded, against staggering odds, in forming Polska Telewisza Kabelowa S.A., known as PTK.

Chase Enterprises

As many before them had learned, however, more money would be needed than they themselves could produce. Trying to raise funds for such a singular project was not easy. In the course of contacting lending agencies and venture capital institutions, however, they were led to Chase Enterprises in Hartford.

David T. Chase was born in Kielce, Poland, in 1929. Placed in a concentration camp at the age of 14, he managed to avoid Auschwitz by jumping into a ditch during a forced death march and hiding in the woods. Five days later, he was discovered by an American unit and brought to a military hospital in Austria. Six months later, he emigrated to the United States with the assistance of the United Jewish Appeal. He remembers passing the Statue of Liberty with only 25 cents in his pocket. With the help of the UJA, he moved to Hartford, Conn. to pursue his formal education. Chase has been recognized with Honorary Doctorate degrees by the Rabbinical College of America, the University of the District of Columbia, and Eastern Connecticut State University.

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

PTK in Gdansk

David Chase met Lech Walesa in Gdansk as work began on the new cable TV system. In fact, Walesa was the first customer connected. Lech Walesa was the union shipyard electrician who led the Solidarity movement that succeeded in replacing the communist President Wojciech Jaruzelski in free elections in 1989. Chase also met Jaruzelski, and actively campaigned for Walesa who was elected President in 1991.

Vice president for engineering at PTK in Gdansk is Gilbert (Gil) Tash, who retired several years ago from a similar position at Times Mirror (the Los Angeles-based MSO). With the help of a competent Polish engineering and management team, Gil has put together a fine, modern 550 MHz cable TV network with extensive fiber trunking. In addition to the three off-air Polish broadcast signals, the system carries programs by satellite from the U.S., the U.K., Germany, France, Italy, Netherlands and Russia. PAL signals from Europe are transcoded to SECAM. The French and Russian signals originate as SECAM.

The underground horizontal plant is placed in ducts provided by Telekomunikajca Polska, S.A., the Polish Telecom. A substantial portion of the population of the Tri-City area (Gdansk, Sopot, Gdynia) is housed in multiple dwelling buildings. PTK has developed an unusual but effective method for attaching risers to the outside walls, even of 20 story buildings.

Experienced Alpine mountain climbers, working on contract, secure one end of a climbing rope on the roof, and lower themselves with their carabiners and mechanical ascenders over the side of the building as if it were a rock cliff. The home-run drop cables are preformed into a harness accurately shaped and dimensioned according to the preliminary survey. The cables are lashed around a steel messenger strand, with a plastic spiral strip. The Alpinist attaches the steel strand to the wall with preformed brackets, both top and bottom, and adjusts the tension so that the harness is held securely in place against the wall. A portion of each drop cable is left in a neat coil ready to be passed through to a wall outlet in the living quarters by an installer upon receipt of a work order.

PTK is presently constructing a cable TV network in Warsaw, a very much larger city than Gdansk. PTK has also begun the process of constructing cable systems in Krakow and Katowice in Southern Poland.

Poland's history

Poland produced the first codified constitution ever adopted in Europe, shortly after the United States adopted the first constitution in the world. Unfortunately, Russia's Catherine II considered such reform to be dangerous to her own political health and in 1792 ordered the invasion of Poland and destruction of its constitution. From 1795 until the Treaty of Versailles in 1919, Poland ceased to exist as an independent nation.

During World War II, the ancient cities of Warsaw and Gdansk were reduced to rubble by Nazi bombs. Yet, in spite of the crushing devastation of its cities, the indomitable Polish spirit is upbeat. The cities have been rebuilt. Democratic institutions and a market economy are working their way out of the abyss left by years of Soviet domination.

Cable TV is an important part of Poland's rebirth. CED

Cable TV is an important part of Poland's rebirth.

BOTTOM LINE

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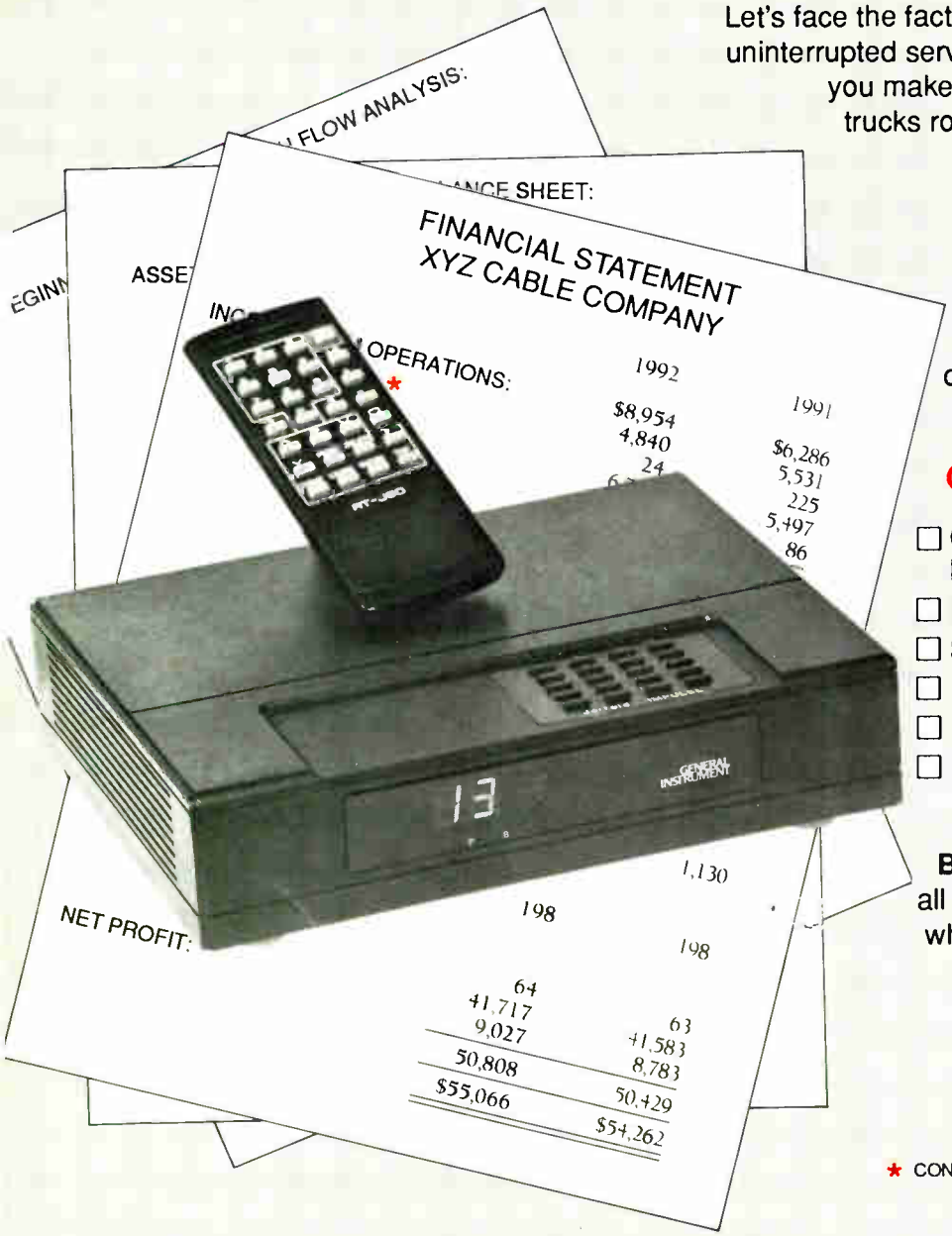

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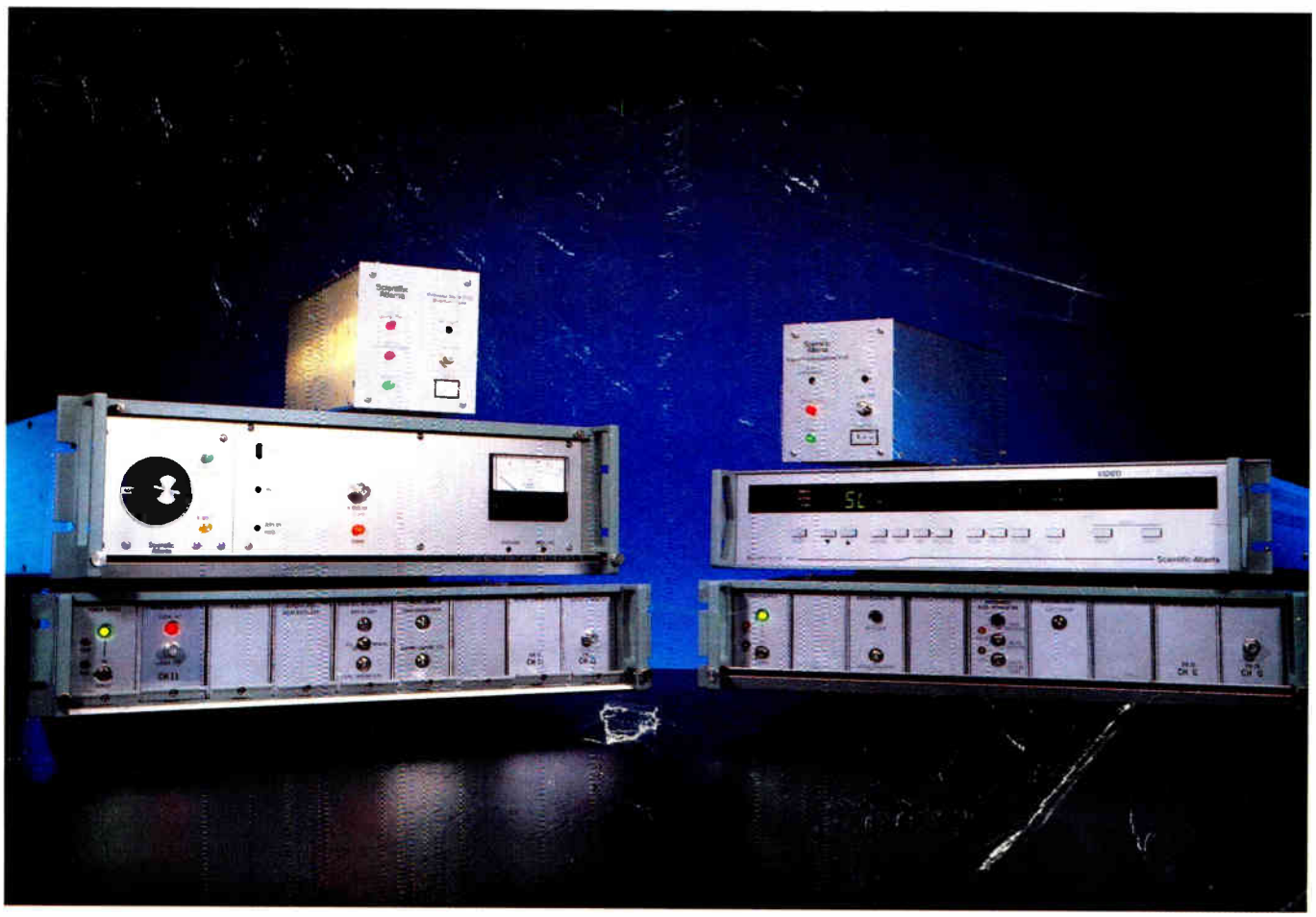
Now you can call the best in the service business for the best in headend equipment.



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Circle Reader Service No. 28