CED

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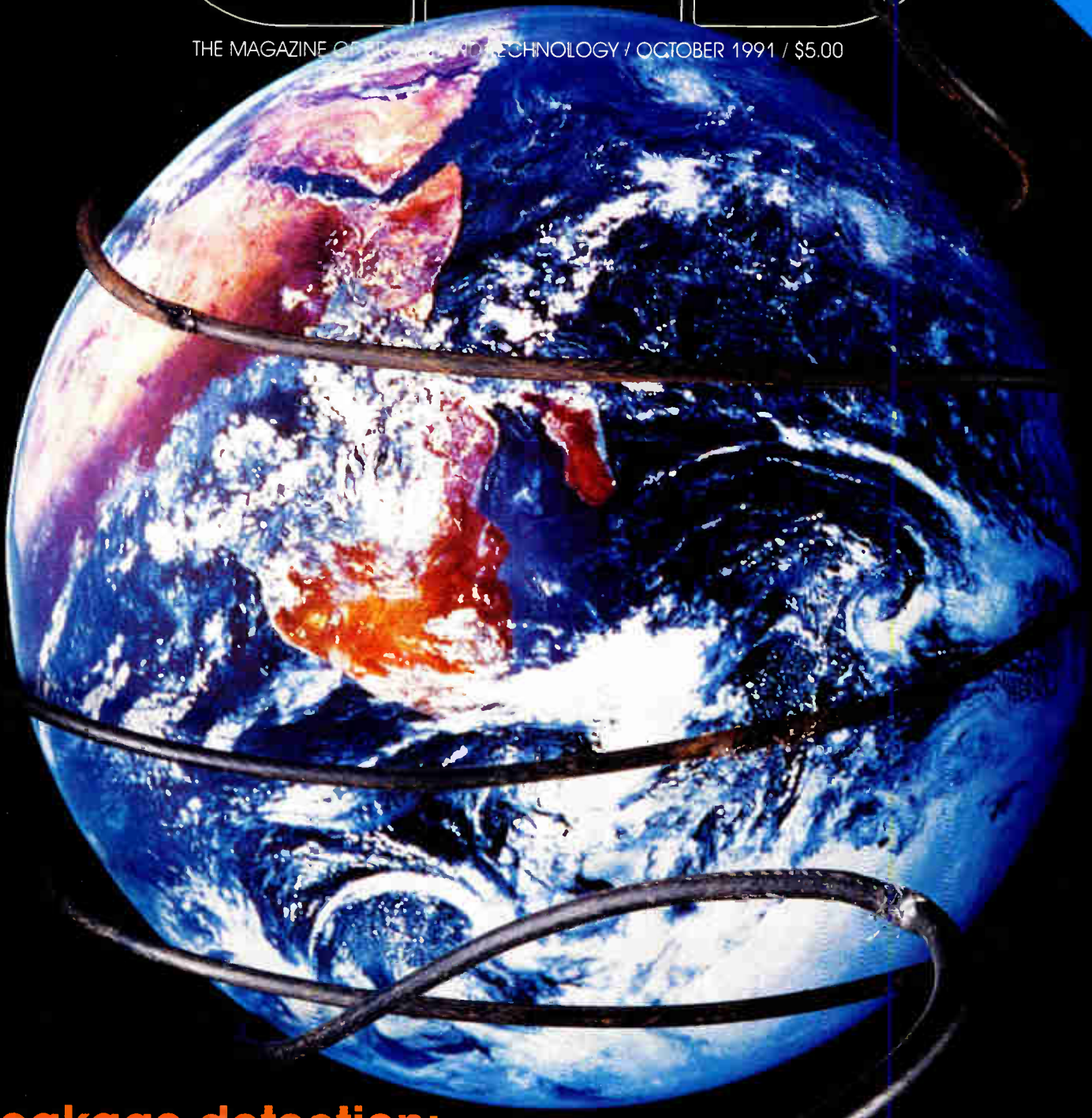
Inside: Video quality comparison chart



Leakage detection: Pinpointing faults from space

—page 28

The future of international cable: A CED special pull-out section

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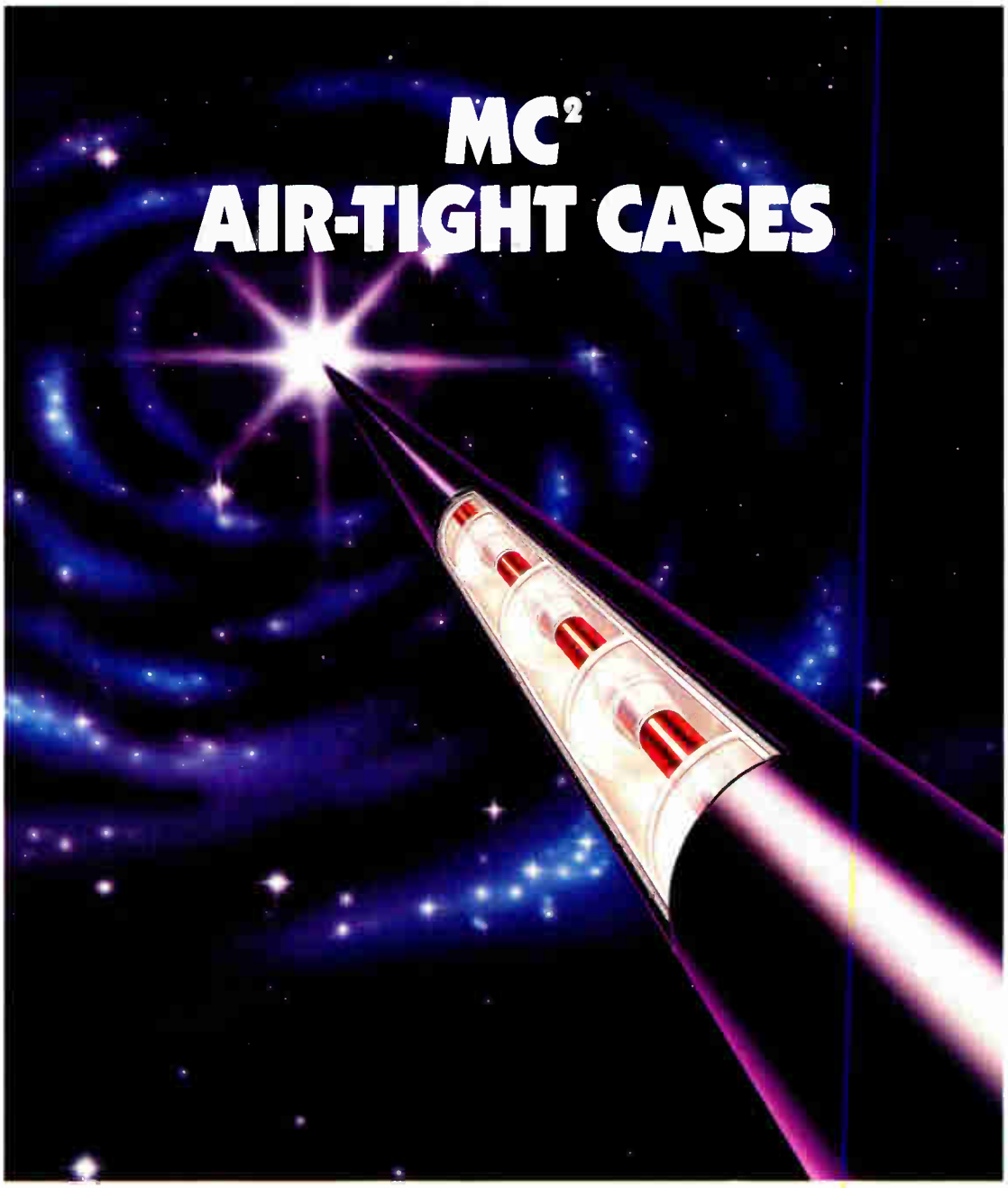

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October 1991

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Volume 17, Number 11

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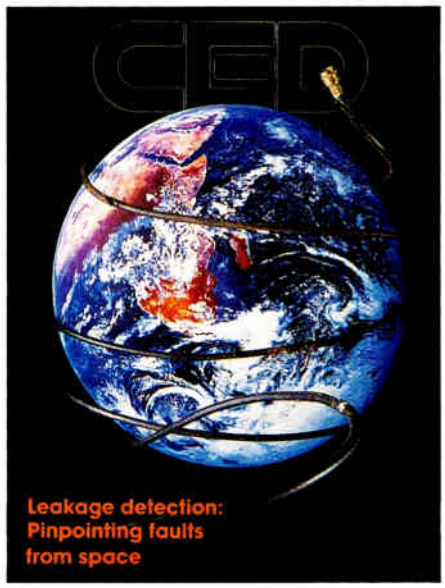

About the Cover:

A new system promises to find signal leaks from 10,900 miles. Photo by Don Riley.

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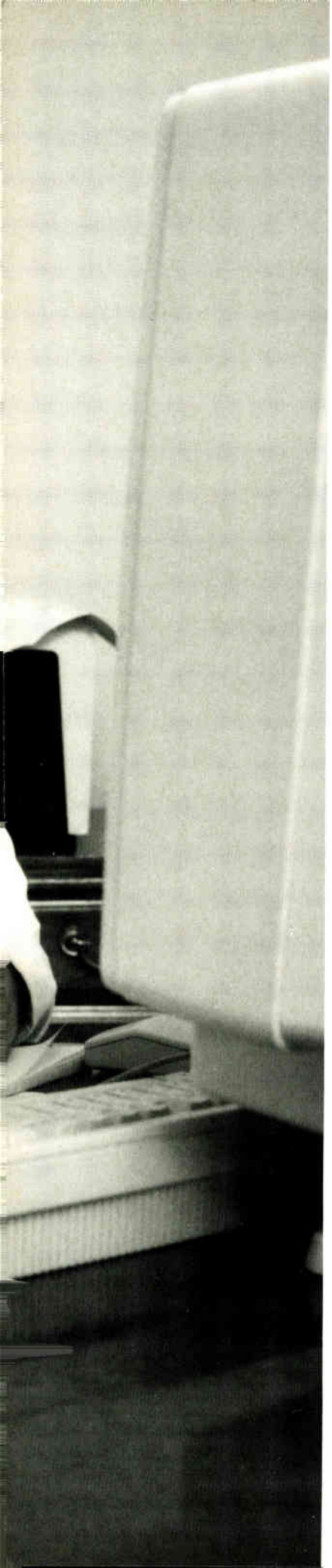

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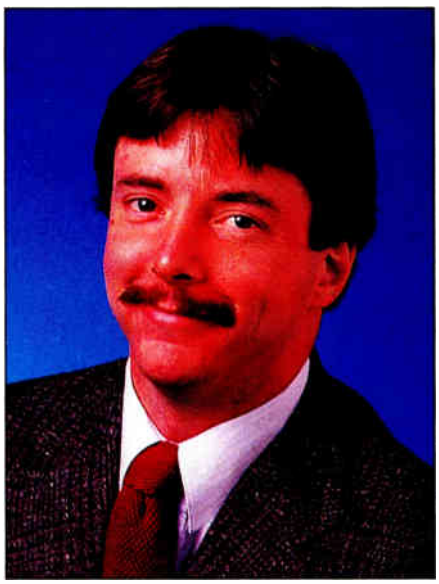
Who's the new kid on the block?

To date, nearly all the discussion and heated debate over the provision of a broadband telecommunications network to the American public has focused on just two combatants, namely cable television vs. the telephone companies.

But recently, a new contender has climbed over the ropes and stepped into the ring. Several aggressive power companies have recognized an opportunity to gain significant increments in revenue by using the communications networks they've constructed for their internal use as vehicles for the communications needs of others.

The addition of power companies into what has traditionally been a two-sided fight threatens to alter the arguments between cable companies and telcos. It also promises to provide everyone with new partnership options.



It may surprise many in the cable TV business that power companies are adding fiber to their systems. But they do have good reasons. Public utility commissions in several states have begun to recognize the value of energy conservation and efforts are underway to include the costs of equipment related to saving energy into their rate bases. This has resulted in power company initiatives toward load management, remote network monitoring and meter reading, and "smarter" homes.

In order to move network information around, power companies need bandwidth. Enter fiber optics. Telephone companies already have their arms open to the power companies, with plans to embrace them openly. In fact, some see ironic synergies between the telephone and power utilities: Telcos need power at the side of the home—precisely the point where power companies need data input.

The changing relationship between telephone, power and cable companies was the focus of a special conference organized by Penn Well conferences in Bethesda, Md. last month. The conference, while strong on telco and power attendance, was weak on cable input. That could, rightly or wrongly, add to the perception that cable is on the outside looking in on some heavyweight business partnerships.

If aggressive power companies and telephone firms are beginning to explore synergistic ventures, maybe it's time the cable operators got involved. If the so-called telecommunication experts are right and economies will force partnerships between traditional adversaries, it makes sense to take the lead. The alternative could be a CATV industry that has no dance partners left.

Roger J. Brown

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First field deployable EDFA

In spite of the cable industry's attempts to settle the issue, the debate over 1310- and 1550-nm fiber optic equipment continues to rage. Jerrold Communications may prolong that debate now that it has announced the development of the industry's first field-deployable erbium-doped optical amplifier.

Last year, when Cablevision Systems engineers revealed to *CED* their intention to utilize fiber optic electronics which operate in the 1550-nm "window," uncertainty over which technology is the "best" for cable TV has polarized operators and vendors. 1310 has a large installed base, but 1550 has gained some ground because it can be transmitted farther without amplification. Furthermore, research on optical amplifiers has focused almost exclusively on 1550 gear.

Jerrold's introduction of the "Starpower" optical amplifier (developed in conjunction with BT&D Technologies, a partnership of British Telecom and E.I. DuPont Nemours) signals Jerrold's intention to develop product for all uses. According to David Robinson, director of Jerrold's Cableoptics business unit, said the device should find applications in numerous long distance applications, including AM supertrunking, fiber-to-the-feeder rebuilds and new construction.

Robinson said the amplifier boasts output power of 15 dBm with little measurable distortion and a noise figure as low as 4 dB. Additionally, internal economic models performed by Jerrold have shown transmitter cost savings of 35 percent over 1310-nm equipment. This, said Robinson, translates into savings of more than $200 per mile.

The device is designed to use both 1480-nm and 980-nm pump lasers. It is priced at $30,000 per amplifier and delivery is 90 days.

TCI, Viacom, Labs issue compression RFP

As expected, Cable Television Laboratories, together with cable operator Tele-Communications Inc. and programmer Viacom Networks, have jointly issued a request for proposal designed to result in the acquisition of equipment for a digital compression program delivery system.

According to a press release issued by CableLabs, TCI and Viacom intend to acquire digital compression devices so that multiple program services can be transmitted over a single satellite transponder. Additionally, the RFP requests designs for in-home decompression units for existing subscribers.

Companies or entities were given until September 16 to show their intent to respond to the RFP and full responses are due by the close of business on October 31.

The request seeks the potential acquisition of satellite link hardware and also seeks to foster interoperability of this and future digital compression program delivery systems, which has emerged as a key consideration for any system designed for CATV application. Therefore, respondents are encouraged to focus their attention on that issue.

TCI's interest in digital compression stems from the operator's desire to reduce transponder costs for some of the program interests in which it has invested. However, TCI's interests also come from the operations side. "We intend to ensure that our cable operations enjoy its benefits as well," said J.C. Sparkman, TCI executive VP and CEO.

Viacom plans to use compression technology to more cost-effectively introduce new programs, said Ed Horowitz, Viacom International senior VP. He added that digital compression technology will result in improved system reliability, picture quality and expanded channel capacity. Horowitz is also chairman of CableLabs' video compression subcommittee.

Blackout equipment in production

Jerrold Communications' addressable satellite receiver (ASR-1000) is headed for production, says headend product manager Charles Dougherty.

The product, first seen at the 1990 Western Cable Show in Anaheim, was developed for ESPN applications—notably, blackout situations. It allows programmers to automate remote tuning of cable headends when operators are faced with alternate programming requirements. And after several months of testing in about 20 different cable systems nationwide—including switching between different satellites and different transponders—ESPN has reportedly accepted the first production units.

Other programmers faced with the

The first production model of Jerrold's addressable satellite receiver (ASR-1000) is presented to ESPN officials. The receiver allows for remote retuning of cable headends to alternate programming when operators are faced with alternate programming requirements. ESPN is the first programmer to use the system. Pictured at the presentation are, from left, Charles Dougherty, headend products manager for Jerrold Communications; Norman Reinhardt, director, commercial product management, VideoCipher Division; Reginald R. Thomas, senior vice president of operations and engineering, ESPN; and Charles Pagano, Jr., manager, engineering project development, ESPN.

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same tuning constraints are expected to follow ESPN's lead, Dougherty predicts.

In a related announcement, Post-Newsweek Cablecom of Norfolk, Neb. already has plans to purchase the receiver, citing the convenience of the product. "Manual feed switching is time consuming and costly if your headend isn't in your backyard, which ours isn't," explains Mike Drahota, plant manager for the system. "A unit such as this is a must for blackout requirements in these situations." Drahota also field tested the product.

First shipments of the unit reportedly began in September.

Instant installs in Monterey

Imagine calling your local cable company to schedule an install and being able to have it done later that afternoon. Impossible? Not if you live in Western Communications' Monterey Peninsula system.

As of this past summer, a new policy in place in Monterey allows subscribers to choose the day *and time* of their cable installation, even on the same day they call for service. Why has Western gone to such lengths? Competition.

"Over the next few years, we are going to see more competition and thinner margins," warns Charles "Kip" Thierot, president of Western. "The companies who survive this change will be those that distinguish themselves with their customers and who offer not only good programming, but excellent service."

So how has Western been able to implement a policy in a 67,000-subscriber system that other operators complain is too burdensome? By making it a system priority. Installers are dispatched geographically be region in nine different areas. No new personnel had to be hired and employees haven't had to work overtime to make the system work, according to Sal Balesteri, the system president.

Balesteri said the system has experienced a reduction in complaints and appointment reschedules because no one was home. Consequently, telephone traffic has been reduced. Furthermore, it is expected that revenues will be enhanced from increased efficiencies and subscriber satisfaction levels will zoom. Balesteri added that the staff seems happier, too because they deal with fewer irate customers.

Jones, S-A swap executives

One month after Jones Intercable executive **Bob Luff** announced his decision to move to the Land of Peaches to join Scientific-Atlanta's executive ranks, S-A's **Chris Bowick** has in turn decided to head West to fill Luff's shoes as Group VP/Chief Technical Officer for Jones.

Bowick will reportedly shape Jones' involvement in emerging technologies, working closely with Glenn Jones. He will continue to contribute a monthly column, *From the headend*, for **CED**.

In a related announcement, Jones president James O'Brien has named **Ken Wright** director of technology for the company (see *Spotlight*, page 16.)

Compression passes Cablevision's test

Digital video compression is indeed a reality, judging from the results of the test conducted in August in Cablevision Systems' Hicksville, N.Y. system.

Cablevision Systems' Wilt Hildenbrand said in published reports, "It looks dynamite. If all it can do from here is get better, then we're headed in the right direction."

The test of General Instrument's DigiSat and DigiCable technology consisted of a feed of 4-to-1 compressed via downlinked in Hicksville from GI's VideoCipher headquarters in San Diego. The signals were then modulated in a standard 6-MHz channel slot and sent out over a four-amplifier cascade.

The results were virtually indistinguishable from one another, according to Hildenbrand. And, the DigiSat transmission matched and in some ways exceeded the usual C-band satellite feed of the same programming.

The test also provided a forum to experiment with long distance fiber transport of video signals. Because Cablevision wanted to use live programming during portions of the compression test, programming had to be sent from the East Coast to the West Coast for uplink by VideoCipher. Cablevision used Vyvx NVN's nationwide fiber network to transport the signals with negligible signal degradation and almost imperceptible timing delay.

Cablevision plans to test the GI system again later in the year with an eye toward insertion of local advertising spots and programming. Also, Cablevision plans to take a hard look at Scientific-Atlanta's compression system and perhaps others.

Compression: When?

The "system of the future," according to Jerrold Communication's Dan Maloney, will offer 35 NTSC channels, 35 digitally compressed (2:1) live video feeds, 10 HDTV channels, and 50 pay-per-view channels (with 5:1 compression, because "taped information is easier to compress than live feeds.") With the aid of compression, operators will be able to offer this lineup on an 82-channel system, Maloney predicted in an Eastern Show technical session on digital compression.

That system, Maloney said, will happen by 1997. Maloney also explained that compression will likely be an evolutionary, not a revolutionary, process that occurs in conjunction with increased fiber deployment.

Jottings

Could the economy be showing signs of recovery? **C-Cor Electronics** is on the receiving end of more equipment orders and has temporarily called back 55 employees who were laid off earlier in the year...**Cablevision Systems** formally announced its intention to convert its 560,000-subscriber Long Island cable system to fiber optics. The conversion, which will take between two and three years, will cost upwards of $100 million and will include 2,000 miles of optical fiber cable...Meanwhile, **Cablevision Industries** announced plans to upgrade its 2,400-mile Columbia, S.C. system with fiber optic gear supplied by **Sumitomo Electric**. That rebuild will feature 300 nodes serving an average of 500 homes...Not to be outdone, **Palmer CableVision** selected **Scientific-Atlanta** as its fiber optics supplier. Palmer will rebuild a major portion of its Palm Desert system using the fiber to the serving area topology. ■

—Roger Brown and Leslie Ellis

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Money for nothing and the bits for free

To grossly paraphrase the lyrics of a song by the rock group "Dire Straits" from several years ago, we are rapidly approaching a time in the telecommunications business when you get "money for nothing and your bits are free."

With apologies to MTV, I think this issue (free bits) will come to be something we care about in the future. In several recent conversations I've had while serving on panels. the question has come up about the potential merging of the telecommunications infrastructure. This merging would occur between telephony, data, video (broadcasting, cable and others) and spurs possibility that all information pieces would be digitized and would become bits.

If this is true, in the distant future the typical American could do all of the magical and mystical things that the RBOCs would like you to believe can be done tomorrow (if only they are allowed to do it.) At that time, an average American consumer would quite simply push a button (or just talk to their computer) and receive bits (data) in the form of text, images and full motion television. This information could be used for ordering groceries, doing homework, preparing a report for the office or watching an entertaining television program.

By Wendell Bailey, Vice President Science & Technology, NCTA

Bit worth

The problem comes about in this future scenario with trying to figure out how on earth we will evaluate the relative worth of one bit over another bit, especially if all of these services originate on the distribution system as digital bit streams.

For instance, does a bit that is sent in connection with a television picture have the same value as a bit sent to represent a comma at the end of a phrase in a fiction story? Does a bit representing a decimal point in your bank balance statement have the same relative value as a bit representing a portion of a pixel on a still image? If this debate were to be carried out, we might eventually come to an understanding that some bits are inherently more valuable than others, but each and every bit takes up precisely the same amount of space in the transmission scheme.

Indeed, to the casual observer (or the expert who may not be too casual), this effect is apparent to direct observation; all bits look the same. It is only how they are reconstructed and in what order that decides what the end product is. However, human nature being what it is and the nature of corporations being what *it* is, we can certainly expect that people will demand the correct price for their bits, especially if their bits are intermingled with bits of a lesser value.

What price tag?

Here comes the conundrum. How do we measure which bits collect which tariffs? How do we keep track of the value of each individual bit in order to charge the correct price for the products? From where we sit now, it seems simple enough. A picture television show would still charge, for instance, a set amount for the entire time that it takes to show a movie. A telephone call could still be charged on *a* fixed rate of "x" number of dollars per month for access to the system—although we must be aware that many telephone companies are moving away from fixed prices for the month of access and going to a charge that is time and distance related.

One can certainly see that this type of scenario might exists for the foreseeable future, but I submit that eventually there will be so many bits and they will be so ubiquitous that, in fact, there will be no way to assign a value to a bit of any sort.

Indeed, an individual bit would be such a small part of the data stream that there would be no way to assign a value to it that would be worth the effort. It has been proposed by some that we just quite simply multiply up the number of bits that equal some mill rate, not unlike devaluing monetary units in third world countries. Thus, instead of speaking of a single bit and its relationship to the product, we speak of a megabit or a gigabit or a terabit and apply the appropriate mill rate.

Free bits?

There have been others who have suggested that since most, if not all, of these future bits are likely to be packetized with addressed, we can sacrifice some circuitry towards keeping track of packets and charge per pack. All of these assumptions fall apart when you consider the world as fully digitized. Thus we come to my whimsical statement from the beginning—that perhaps bits will be free.

Perhaps it will be so difficult to adequately track and account for and bill for service on an actual value per volumetric unit basis that we will have to find a way to charge what is economical and efficient. I suspect that such a way will ignore how many bits you get and will quite simply charge you for how much time you are connected to the network. Whether or not each individual service provider will have different charges for the time you use their service versus the time you use someone else's service remains to be seen.

I can see a scenario in which the grand output port that is the gateway for all incoming service quite simply does an internal apportionment, not unlike a compulsory license for jukeboxes. It would simply distribute money based on your claim as to what your survey showed people in the world did during the month or year that this mass of data was directed towards the community.

In any case, if in fact the world becomes all digital in the future and if the issue of how to charge people becomes real, there will be certain business opportunities for people who wish to be "bit wranglers." In turn, that means that the meaning of the word "cowboy" in the 21st century will likely be different than it has ever been before. ■

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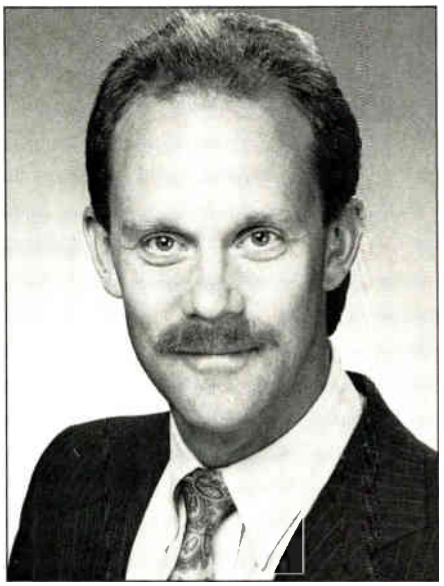

Ken Wright

One step ahead

Ken Wright, director of technology for Denver, Colo.-based Jones Intercable, is one of those people that always seems to stay *six* months ahead of potentially disastrous career situations.

Take his decision to leave United Artists seven months ago, for example. Shortly after he was added to the Jones Intercable payroll, United Artists was purchased by TCI—and we all know what could have happened to Wright had he stayed. But instead of touching up his resume, Wright is busily leading Jones' day-to-day engineering operations as the company's director of technology.

The same thing happened some 11 years ago, when Wright was doing engineering work for now-defunct Centel, a Chicago-based MSO. Wright opted to board ship at United Artists shortly before Centel sold off all its cable properties.

Perhaps it is these calculated and fortuitous decisions that best summarize Wright's cable background. Consider, for example, how he entered the cable business. Unlike other cable engineers who drift into cable from other industries, Wright worked summers as an installer to finance his B.S. degree in electrical engineering/business administration at Western Michigan.

From there, Wright's cable career path started to climb. After getting seasoned as an installer, technician and bench technician in southern Michigan, Wright headed south, to Florida. "I had gotten a lot of theoretical engineering knowledge while in school, and I wanted more work experience," Wright explains. "So after school (in 1978), I moved to Florida and worked for Superior Electronics"—doing amplifier repair and engineering consulting work.

In 1980, Wright landed a job in Michigan as the system manager for two small cable operations—and headed back home. It was then that he decided to wrap up his yet unfinished degree at Western Michigan—but this time, his thirst for knowledge stepped outside of pure engineering.

"I took a hiatus from my education while I was in Florida, and when I was hired as a system manager I realized I need to know more about the management, accounting and finance sides of the business," Wright recalls.

"Engineers are quite often stereotyped as being narrow-focused; as seeing only the 'techie' side of the business," Wright continues. "I guess with experience and an education, I've gotten a good grasp of both sides. It's a good blend to have, especially when you can take a technical project and predict what the impact is going to be on all aspects of the business, including the bottom line."

Engineering challenge

Indeed, Wright spent eight years dealing with the bottom line in his role of system manager before he again packed up and moved, this time to Richmond, Ky. where he donned a regional engineering manager's cap for Centel Cable TV. It was during this brief stint that Wright recounts his greatest pure engineering challenge—interconnecting 14 headends and new communities using FM fiber optics and AML microwave.

"It was a pretty big project, because at that point in time, there was not a lot of industry experience to draw upon regarding FM fiber applications. I had to do some independent brushing up on the subject," Wright admits. "But it was very rewarding, even though I wasn't actually there when they threw the switch."

He wasn't there because he had already moved to Denver to head the engineering department for United Artists Western Division, a move precipitated by Centel's decision to sell its cable properties. "The closest thing I can liken (the job) to is being a consultant but having a paycheck instead of the financial uncertainty," Wright explains.

"We had something like 700,000 subscribers in 11 states, spread out over 26 systems—which made our division one of the top ten MSOs, I think. Just our division," Wright laughs. "Given that situation, it was a very diverse job. Again, I think my educational blend of engineering and business really helped me to work with the diversity."

Not surprisingly, Wright's business education has made him into a pretty savvy manager, too. "I'm more the type that delegates projects and then gives the person room to be creative. I like to give people room to develop themselves while still maintaining accessibility so that they don't fall down completely," Wright explains.

Move to Jones

Seven months ago, another fortuitous decision landed Wright into his current perch on the second rung from the engineering top at Jones. "Now, I'm more focused on the technical side of the business again. But still, I have to be cognizant of the other sides of the business. I work frequently with the operations and marketing groups, for example," says Wright.

One of Wright's current projects is getting ready for the company's rollout of addressable technology in preparation for NBC's Olympic Triplecast next year. This is not without some reservations, however. "Jones has typically gone the subscriber-friendly path, with traps. That's just not as viable an option with the way the Triplecast is being aired," Wright explains.

Other projects include a search for cost-effective ways to prepare Jones' networks for future businesses, such as enhanced PPV and commercial insertion, PCN, alternate access and "any other potential businesses that we may not even recognize as businesses at this time."

And on the homefront, current projects include "picking up the load" with Wright's son, Zak, while his wife, Becky, returns to college for a degree in fitness and nutrition. "That's where most of my free time is spent—just enjoying my family."

Interestingly, though, Wright's talents include music—he spent several of his Michigan years playing in a weekend "parties and weddings" rock band. "It's the only hobby I know of where you have fun *and* get paid to do it," Wright muses.

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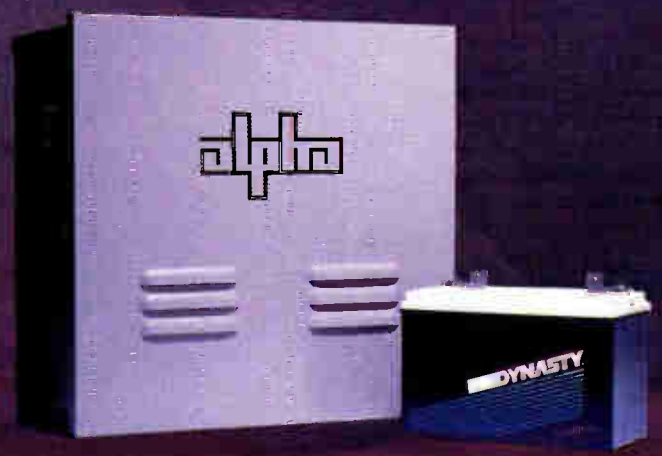

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SPOTLIGHT

Current concerns

"My major concern is that we as an industry realize that we need to prepare *now* for future businesses. Competition isn't a future threat; it's right around the corner. And it's not just telcos—there's a couple of sleepers out there, like MMDS and DBS services," Wright emphasizes. "So we need to adjust our thinking now, rather than when it happens. We need to start acting as though we had a competitor in the marketplace, so that when one comes along, we're not caught by surprise.

> 'We need to adjust our thinking (about competition) now, rather than when it happens.'

"Along those lines, my biggest current challenge is trying to bridge that gap between technical excellence in the systems and the financial limitations the whole industry is faced with right now," Wright laments. "As a systems operator, we're feeling all kinds of pressures. From our own desires, for example, we're striving toward greater technical performance as well as greater technical versatility—trying to have our networks ready for future businesses.

"But at the same time, we've got these terrible financial restrictions that the whole industry is faced with. That just makes a real big gap. You want to do more; you have fewer resources," Wright says.

How is that gap bridged? "Oh, boy. If I had that answer, I'd be a hero," Wright laughs. "I guess that's why I'm in engineering, not finance."

Not as though a lack of finance knowledge is a major hindrance for Wright, however. No finance background? No problem. He'll just go out and pick up another degree, to better prepare himself for the future. Not surprisingly, in fact, Wright is currently working on his M.B.A. at the University of Colorado.

And one thing is certain: if there's an answer to be had, Ken Wright won't stop until he finds it. ■

—Leslie Ellis

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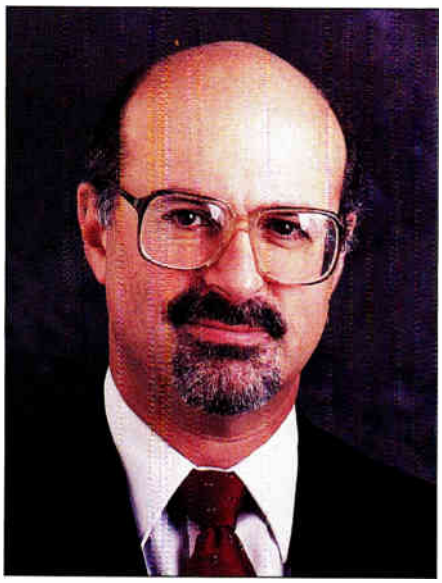

The HDTV selection process

The FCC's Advisory Committee on Advanced Television will recommend the "best" HDTV format to become the U.S. standard. But what does "best" mean? This article looks at the HDTV selection process as it is now being developed.

Elements of the selection process

The FCC Advisory Committee will submit a report to the FCC in September 1992, recommending (hopefully) which one of the six HDTV formats being tested should be selected as the new U.S. standard for television broadcasting. The Advisory Committee (once again, hopefully) will be able to reach a consensus that one of the six systems is the best.

Since the Advisory Committee members come from a variety of backgrounds within the video industry, a consensus may be difficult to achieve. One of the working parties within the Advisory Committee is preparing a framework for the selection process so that agreement can be reached on what elements and features are important.

The selection process is intended to simulate a marketplace decision by a buyer (in this case, the buyer is the Advisory Committee or the FCC) who doesn't know precisely what features he wants, and has several nearly-off-the-shelf products from different vendors to choose from. The buyer need not make up his mind about which features he values the most until after he has examined all the products. And the vendors have the opportunity to try to convince the buyer to change his mind.

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

Selection criteria

In fact, there are 10 important features, called "selection criteria," which were chosen earlier this year by the Advisory Committee. These are:

- coverage area compared to NTSC;
- percentage of TV licensees that can be accommodated;
- transmission robustness;
- audio/video quality;
- cost to consumers;
- cost to broadcasters;
- cost to alternative media;
- scope of services and features;
- interoperability considerations;
- extensibility.

The following descriptions of the 10 criteria are preliminary; work is still underway to specify how they are to be measured.

Coverage area compared to NTSC. Each TV broadcaster wants to have as large a potential viewing audience for HDTV as for NTSC programming. It will be a challenge to set the power levels of these new stations to maximize coverage without causing interference to existing NTSC stations.

Percentage of TV licensees that can be accommodated. It may be difficult to find enough unoccupied TV channels to give every NTSC broadcaster a new HDTV station with a large enough coverage area, particularly along the East Coast, because of interference considerations. Because the amount of spectrum for television is limited, these first two selection criteria are in direct conflict with one another. Luckily, digital signal formats can operate with lower power levels than analog, and are more robust against interference than analog.

Transmission robustness. The HDTV signal must be error-free at the receiver, in the presence of noise, multipath echoes, interference from land mobile transmissions and airplane flutter. These properties will be tested at the ATTC.

Audio/video quality. The quality of the HDTV picture will be judged subjectively by non-expert viewers. These tests will be conducted by the Advanced Television Evaluation Laboratory in Ottawa, Canada.

Cost to consumers. Although it may be difficult to estimate the eventual prices of HDTV receivers, it should be possible to compare the complexity of HDTV receivers based on system design information supplied by the HDTV proponents. In general, the more complex the design, the more expensive it will be.

Cost to broadcasters. A broadcast station will need to purchase new studio and transmission equipment for HDTV. If the existing transmitter tower cannot bear the weight of a new transmission line, a new tower may be needed. New towers can be very expensive, particularly if new zoning laws are now in effect.

Cost to alternative media. A cable operator may need to install new headend processors and new converters to carry HDTV signals. There may be slight differences between the digital HDTV formats that make one more "cable-friendly" than the others, but at this point it is hard to see how this criterion will help in choosing among the digital formats.

Scope of services and features. This means "the more audio and data channels, the better"—but channel capacity taken away from video may result in poorer picture quality.

Interoperability considerations. HDTV signals may be delivered to the home by TV broadcast, cable TV system, satellite or pre-recorded tape. This criterion will be important if any of the HDTV formats are "unfriendly" to non-broadcast media.

Extensibility. The winning HDTV format should be able to work at several different quality levels and have the ability to support and incorporate extended functions and future technology advances.

Conclusion

The HDTV proponents will now be turning their efforts from building hardware to showing how their systems excel in these 10 categories. Meanwhile, the Advisory Committee and its working parties will be refining the definitions of these selection criteria and deciding on other parts of the selection process. If all goes according to the current plan, this should lead to an industry consensus and a 1993 decision on a new television standard. ■

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Danger ahead

The cable television industry is solidly resisting the proposed FCC standard requiring +6 dBmV minimum subscriber signal level. Opposition is based on excessive additional costs that would have to be passed on to subscribers, on technical difficulties, and on the experience over more than 20 years that high quality service can be provided under the original 0 dBmV minimum standard. These are good and valid reasons *for* sustaining the status quo, and I hope they prevail.

The FCC's attempt to define picture quality for cable TV is ironic. For the past 40 years, FCC activity regarding broadcast television technical standards has been concentrated on interoperability and interference. The FCC has no enforceable standards directly defining broadcast TV picture quality in the way it seeks to define cable TV performance.

Subjective tests

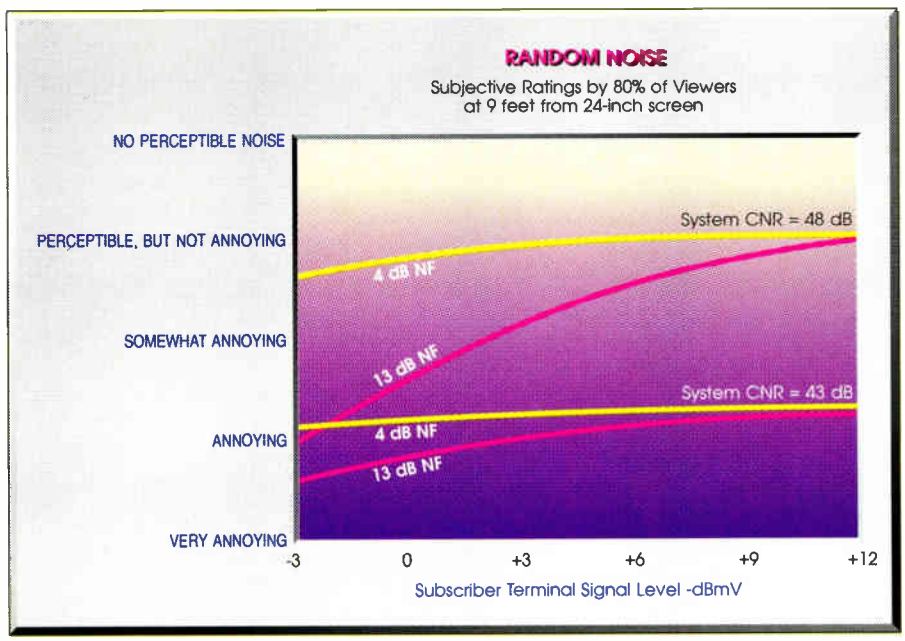
Viewer reaction to picture impairment due to random noise was tested recently by Bronwyn L. Jones, an internationally renowned psychometric expert at CBS Laboratories before the labs were terminated. Although her recent data have not yet been published, they appear to indicate that viewers are noticeably more sensitive to television picture impairments today than in the past.

By Archer S. Taylor, Senior Vice President, Engineering, Malarkey-Taylor Associates, Inc.

The figure on this page has been adapted from her paper to illustrate the subjective impact of random noise in TV pictures as a function of system carrier-to-noise ratio (CNR), and the visual carrier signal level and noise figure at the subscriber terminal.

The good news is that if the noise figure (NF) at the subscriber terminal is low, say 4 dB, it really doesn't make much difference whether the signal level is 0 or +6 dBmV. Even if the NF is high, say 13 dB, and if the system carrier-to-noise ratio (CNR) is at the minimum 43 dB proposed by FCC, the subjective rating would not noticeably be improved by increasing to 6 dBmV.

The bad news is that at 43 dBmV system CNR, the picture is probably noisy enough to be annoying. Even more ominous is the fact that with system CNR at 48 dB, picture quality is substantially degraded at 0 dBmV by the 13 dB NF commonly specified for converters, and noticeably degraded even at +6 dBmV. The Commission has made it quite clear that the proposed "minimum" standards are simply a "means of defining an acceptable quality of service at the worst subscriber location and thus a better quality of service to the average subscriber." However, even 48 dB system CNR is significantly degraded by the 13 dB NF.



Competitive dangers

The disquieting message in these curves is that the 13 dB NF associated with set-top converters is a menacingly ubiquitous source of picture degradation throughout our systems.

With the emergence of MMDS (private cable) and DBS, we will soon be embroiled in such concerns as competitive pricing, programming, choice, service, convenience and even availability. But the key focus in this competition for subscribers is likely to be on picture quality. Already, we find that MMDS signals are generally better and less noisy than many of those that cable TV delivers.

There may be many reasons for this, but that 13 dB noise figure must be considered a major part of the problem. Short of a complete shift to digital transmission (and compression), fiber-to-the-tap, or a low-noise converter, we may not be able to compete with the clarity of signal widely perceived in MMDS and *defacto* DBS (backyard TVRO).

Of course, random noise is not the only picture impairment on cable. We must address other pesky problems such as cross-modulation, intermodulation, group delay errors, microreflections, and phase noise. But "snowy" pictures are likely to symbolize for potential subscribers the major signal quality differences between competing transmission technologies.

We could continue to ignore this fact only at great risk. The FCC's 6 dBmV proposal does not overcome the problem of the 13 dB NF. Maybe there are more practical solutions than a low-noise preamplifier, but we must come to grips with this issue. ■

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Digital delivery technology for CATV networks

Editor's note: *This article is the first of a four-part series on digital delivery technology. The original paper was presented at the 1991 SCTE Fiber Optic Conference in Orlando, Fla.*

With the evolution of *CATV* distribution networks to higher bandwidth-capable technologies, cable system engineers and network planners are faced with a need to develop and implement compatible analog broadcast networks and digital transmission networks.

The intent of this article, and subsequent articles, is to provide cable engineers with the history of digital telephony—its origins, capabilities and limitations.

The North American (NA) digital hierarchy will serve as the basis for these articles, as it represents the maximum intersection with the CATV field of interest.

The NA digital hierarchy in its present form starts with a 64 kilobits/second (kb/s) per voice channel allocation. This rate is derived from a 4 kHz channel bandwidth, sampled at 8 kHz (the Nyquist rate) and coded into an 8-bit code word (8 kHz samples/s x 8 bits/sample = 64 kb/s).

The $2^8 = 256$ quantization levels do not yield acceptable noise performance for toll grade telephony, so a compression/expansion (companding) law known as μ255 is used to improve performance. Similar issues regarding the quantization performance of video coders exist with implementations using 8- and 9-bit coding.

The key here is that μ255 is an accepted NA standard, implemented by all 64 kb/s PCM (pulse code modulation) codecs intended for the telephony market. The standard was defined and is "maintained" by the Bell System and all vendors' compatible codecs can be interconnected.

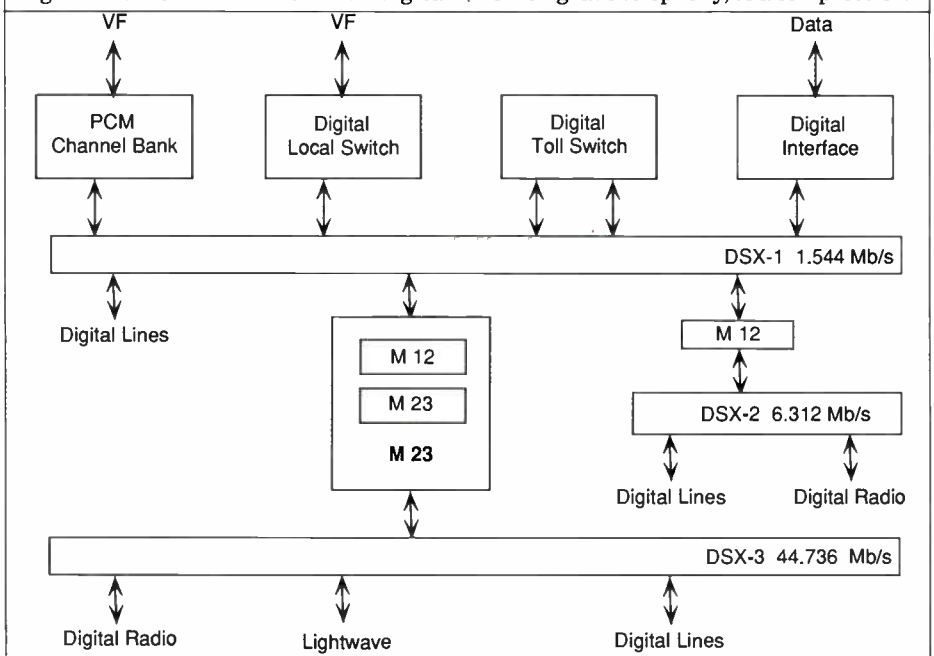
While it is obvious that an 8-bit codec cannot be connected to a 9-bit, a more subtle incompatibility exists between the NA hierarchy and the European digital hierarchy, where each voice channel is coded at 64 kb/s but uses a different companding law (A law).

Therefore an international digital connection, while bit rate compatible, must pass through a companding law converter.

The first transport interface rate results from a combination of three primary technological forces:

1. Reliable transistor level digital circuits operating at 1 to 2 megabits/second (Mb/s) were reasonable (circa 1965).
2. The capability of paired exchange grade 22 gauge copper cable was judged to be in the 1 to 2 Mb/s range.
3. Telephony engineering for the analog transmission network was performed on a "group" of 12 frequency division multiplexed (FDM) signals. Engineering of new systems that could be easily related to group level fit with then current forecasting tools and were therefore preferred.

Following some simple math, one group of combined digital channels was too inefficient, three were too high in bandwidth, and two groups—or 24 channels running at 64 kb/s each, or a total of 24 x 64 = 1.536 Mb/s—were a good match to the technological capability. Add 8 kb/s for inter-terminal synchronization and the digital telephony equivalent of the NTSC video channel known as the DS1 primary digital rate at 1.544 Mb/s was established.



Digital Hierarchy - Simplified View

By Carl J. McGrath, AT&T Bell Laboratories

Carl J. McGrath is responsible for system engineering and design of AT&T's lightwave AM transmission products.

Development of T1

Once a transmission rate was established, various schemes for transporting the 1.544 Mb/s stream among class five switching offices were developed. The most popular of these became the T1 digital repeater line, operating on 22 gauge copper twisted pair with regenerative repeaters spaced approximately every 6,300 feet. Once again, compromises between the capability of current technology and cost resulted in a transmission format, known as 50 percent duty cycle alternate mark inversion (AMI)—a.k.a. bipolar—that was well suited to intra- and interoffice connections.

This line code had zero DC spectral content, was robust with respect to low frequency hum noise (induced 60 Hz) and provided a large spectral content at the half baud rate of 770 kHz. This aided the T1 regenerator in reconstructing the digital stream at each repeater location where a local timing signal had to be extracted from the information stream. A convenient assignment of high transition content 8-bit code words near the zero or idle channel code word for each digitized channel helped maintain (statistically) the spectral energy in the retiming channel with little added complexity.

Little consideration was given to the future sources of per-channel 64 kb/s information as to how their spectral content (transition density) would be controlled. The T1 line format was agreed upon as consisting of the output from a D-type channel bank.

Continuing onward

As deployment progressed and costs improved for these new digital lines, analog carrier systems and direct per voice channel metallic trunking were removed from the class five interoffice network. Continued expansion created the obvious need for a digital equivalent of the long haul FDM analog carrier systems (L carrier) where multiple groups of channels were stacked using classical block conversion techniques and broadband transmission facilities.

While channel banks combining larger numbers of 12 channel groups had become practical from a technological perspective, the pervasiveness of the DS1 interface precluded the introduction of direct higher rate terminals. Instead, additional interfaces, digital multiplexers, were developed to combine several DS1s into higher rates.

Economics, along with the need to compete with the established analog facilities and a growing recognition of the potential of digital transmission led to the establishment of a digital network hierarchy of rates that matched or exceeded the popular analog coaxial systems. Facility rates of 6.312 Mb/s, 44.736 Mb/s and 274.176 Mb/s were established in a multiplex hierachy as shown in Figure 1.

It is interesting to note that at the time this hierarchy was established, clear technological and economic feasibility for the rates and required media performance did not exist. Experience with DS1 had, however, revealed the need for such forward looking planning and standards.

Now that we've examined digital channel banks and primary rate facilities, the next article will take a look at digital multiplexers and higher bit rate systems. ■

Global positioning system for leakage management

It should come as no surprise that the cable industry's response to signal leakage and CLI would be a rash of new ideas and technologies. One of the most intriguing developments may be the use of the Global Positioning System (GPS) for locating cable leakage. GPS is a satellite-based system, developed by the United States Department of Defense to provide an accurate and dependable worldwide navigational system.

Even while the CLI rules were being drafted, cable engineers were trying to develop methods for testing the integrity of cable systems from the air.The first attempts used LORAN, or long range, low frequency radio navigation developed many years ago for maritime use. More recently, LORAN receivers have appeared in aircraft instrument panels. But LORAN has limitations, not the least of which is the fact that most transmitters are located in coastal areas.

In contrast, by integrating a GPS receiver, positions with accuracy better than a width of a street are recorded. And, the system works equally well on the ground and in the air.

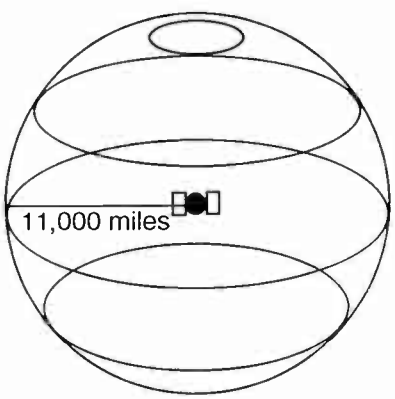


Figure 1

The Global Positioning System is based on a constellation of 24 NAVSTAR satellites in polar orbit 10,900 nautical miles above the earth. Unlike the geosynchronous satellites which deliver cable programming services, these satellites move rapidly, making one complete revolution every 12 hours. Constant monitoring by the Department of Defense (DoD), coupled with precise synchronization of the atomic clocks aboard each satellite, enables detection of each satellite's exact position within nanoseconds. This further enables a process called "satellite ranging," which triangulates position.

Since radio waves travel at the speed of light (a known constant—186,284 statute miles per second), if we know where a satellite was when it transmitted its signal, we can measure the time it takes for the signal to reach our receiver and calculate the distance. If we can range the distance from three satellites, we can then triangulate our position anywhere on earth.

For example, if we know that we are 11,000 miles from a given satellite, then our position in space can be narrowed down to somewhere in the

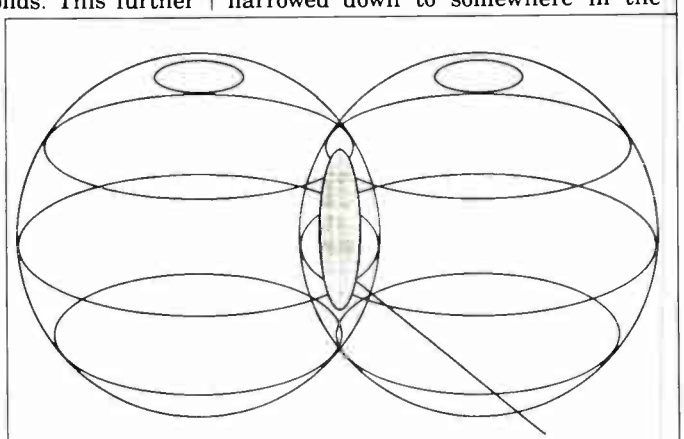


Figure 2

By Gil Becker, Intercontinental Cable Services Inc.

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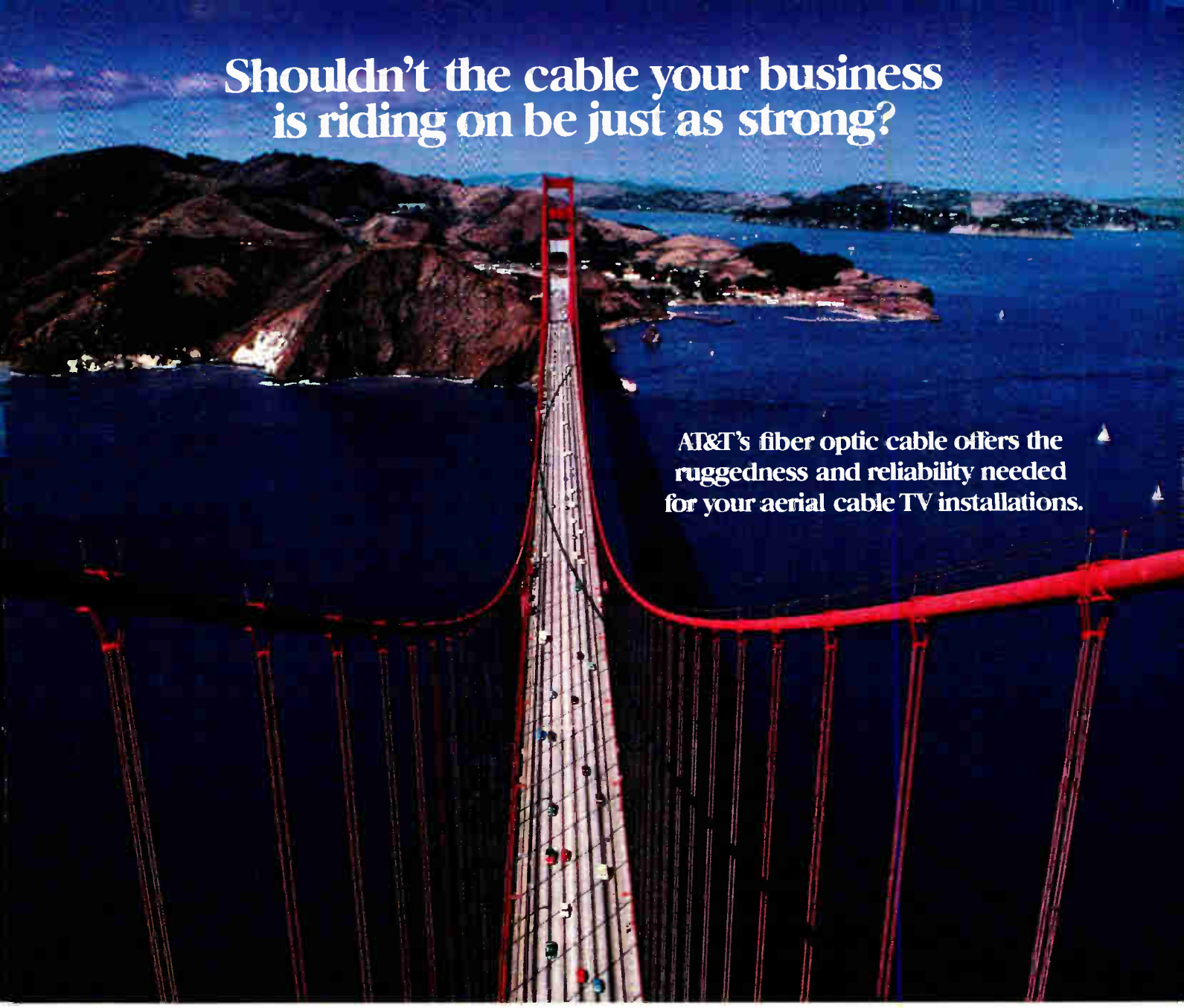

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which affect GPS accuracy.

Even atomic clocks are subject to minor variations. The DoD monitoring stations can adjust them, but some inaccuracies do affect the calculations. Receivers can make computational errors of rounding or experience electrical interference. These errors are either very large or very small. Large errors are easily identified, but small errors contribute a few feet of uncertainty into every measurement.

"Multipath errors" result from signals which reach the receiver from reflections; much like the phenomenon which causes television ghosting.

GPS receivers minimize errors by antenna design and sophisticated signal processing circuits and programs, but some degree of error is inevitable. Fortunately, all these inaccuracies taken together will produce errors of less than 40 feet with a good receiver. However, there is a way to achieve accuracy in centimeters.

Differential GPS is the ultimate in precision. Surveyors have used GPS for years, eliminating the need for a crew to make multiple line of sight connections to known benchmarks. A surveyor can walk to the points he wishes to stake and press a button. GPS will record the exact location.

The method is simple. Use one GPS receiver as a stationary reference in a known location. It transmits an error correction message to other GPS receivers in the area, which use it to correct their position solutions. Errors measured by all receivers in a local area will be the same, thus the correction factor can eliminate all of the possible error from clocks, satellite position or ionospheric and atmospheric delays.

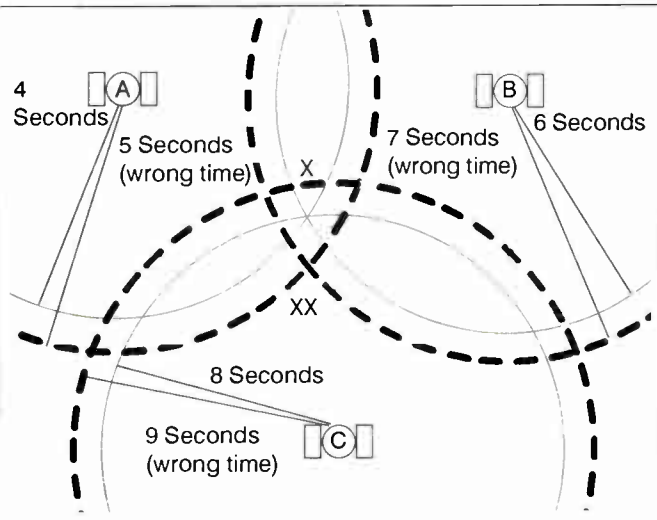

Figure 7

GPS is currently incomplete. Of the 24 satellites that make up the system, only 21 are active at press time. Additional launches are planned in late summer. This means that there will be periods when there are not enough satellites above the horizon to provide accurate positions. These periods total less than four hours out of each 24-hour day.

However, it is relatively easy to schedule around these gaps by using the receiver's almanac. The satellites pass over one of the DoD's monitoring stations twice each day. The DoD measures the satellite's altitude, position and speed, looking for alterations called "ephemeris errors." They are usually minor and are the result of gravitational pull from the moon and sun and by the pressure of solar radiation on the satellite.

Correcting errors

When the DoD has measured the satellite's position, it relays the corrections back to the satellite. The satellite sends a packet of data, including the corrected position, with its timing transmission. The GPS receiver downloads this data into an almanac, which can be accessed for a schedule of satellite availability.

Though it is new to the cable industry, GPS technology has been in use for several years. It was inevitable that CATV, with its heavy reliance on maps, fleets of service vehicles and physical plants covering large geographic areas would find uses for this technology.

Some operators are currently investigating Automatic Vehicle Locating systems, also based on GPS, which provide real-time status monitoring for every vehicle in the fleet. This may be the ultimate resource tool for the mobile environment.

It can also be expected that cable will develop other new uses for this technology. Monitoring for cable leakage and CLI is just the beginning. ■

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Circle Reader Service No. 18

Fiber helps Continental Cablevision's quality show

The cable television industry is one of the fastest growing new markets for optical fiber. In recent years, the industry's focus has shifted from coaxial cable to fiber in the supertrunk plant because it is cost effective and provides customers with a better signal—according to some estimates, picture quality is at least 50 percent better than that obtained using high performance amplifiers and coaxial cable.

For Boston-based Continental Cablevision, currently the country's fourth largest multiple system operator (MSO), with 2.7 million subscribers, the attributes of fiber are complimentary to the basic tenets of the company's philosophy—to expand and upgrade existing systems to provide quality service.

Case in point. Back in 1988, when Continental purchased several small systems in California, the systems comprising it were mostly 400 megahertz (MHz) systems capable of carrying from 2 channels up to 53 channels of full-motion video. One such system is in Hollywood, which serves a part of Continental's Los Angeles territory. The 400 MHz system is a sub-split system with five AM return channels or two FM return channels.

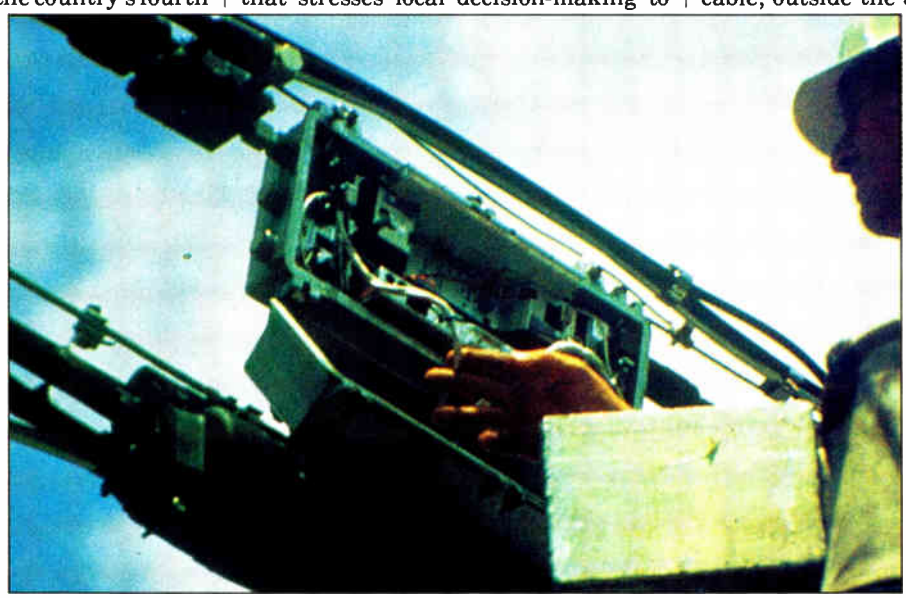
Setting this system apart from most others is its large plant coverage in a small, densely populated portion of Los Angeles. We have 212 miles of cable plant, passing more than 100,000 homes with approximately 38,000 customers served at this time. Condominiums and other multi-dwelling units account for the high density in the Hollywood area.

By Scott Striegel, Continental Cablevision, Los Angeles, Calif.

The city of Hollywood, which encompasses Sunset Boulevard, is home to many production companies and film studios which are among Continental's customer base in Los Angeles.

Quality is what viewers say it is

When we decided to replace the Hollywood system's original high powered, headend-to-hub microwave system, we opted for fiber. The decision to go with fiber was made locally, in keeping with our corporate philosophy that stresses local decision-making to achieve quality. In terms of quality, fiber is a proven performer in signal quality, reliability and adaptability to existing and new technologies. It is also quite cost effective.



Splicing the fiber. Photo courtesy of ONI.

For Continental, there was an additional bottom-line incentive favoring fiber optics over microwave: repairs or replacement of parts for individual microwave transmitters can cost anywhere from $3,000 to $5,000 per unit. This proved to be an important consideration because the microwave that served our Los Angeles customers dated from 1982. It was getting to be quite expensive to make the necessary repairs.

The initial cost outlay for fiber and that of a new microwave were approximately equal. While there were other microwave options which would have been less costly than replacing the existing antenna, we decided that the lower power consumption of fiber tilted the scales in its favor. When the choice to go with fiber was made, Continental selected fiber manufactured by AT&T's Network Cable Systems.

When it came time to replace the microwave, we chose AT&T's LXE fiber (Lightguide Express Entry) cable, which features linear strength members placed longitudinally along the cable, outside the armor and imbedded in a high density polyethylene jacket.

The design of the cable and the research that went into it, in terms of packaging the fibers, made more sense to us than that of any other cable. We know that it's entirely possible that an installation crew will lay it down and inadvertently back a truck over it. It can also be damaged in some other way during construction, or it can be stressed during long-distance pulls.

Fiber bends to the challenge

Bending was also a particularly important consideration for Continental in its Los Angeles serving area. Although primarily an aerial installation, part of the installation was also underground because there were major street crossings to consider. We had to make a lot of 90-degree turns where we had to go from aerial to underground and back to aerial. This involved making 17,000-foot pulls, without making any splices in the line. This is a challenge in itself. In addition, we were faced with backyard easements, tree trimming and other make-ready work necessary so that we could pull the lines without snags.

Continued on page 54

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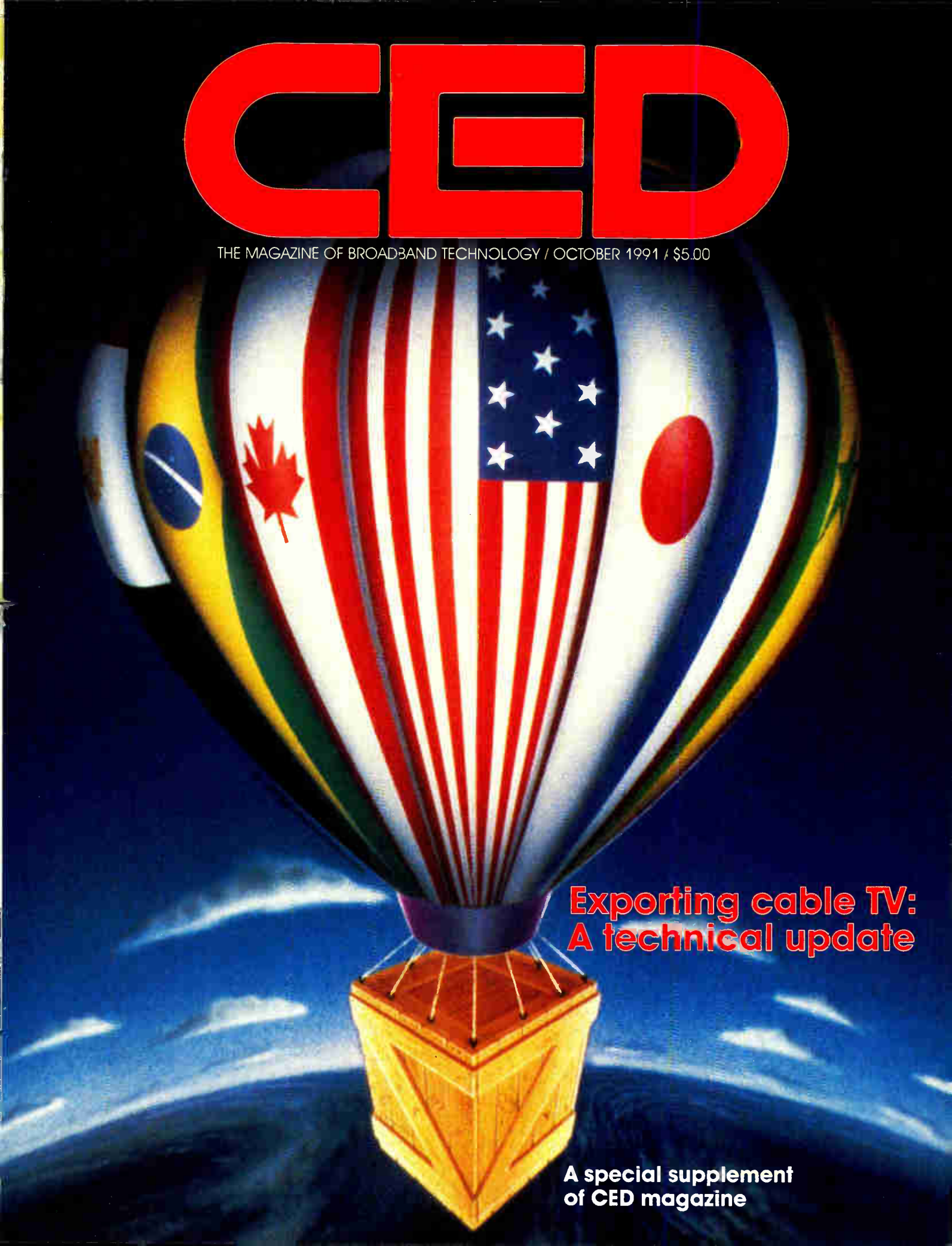

Exporting cable TV: A technical update

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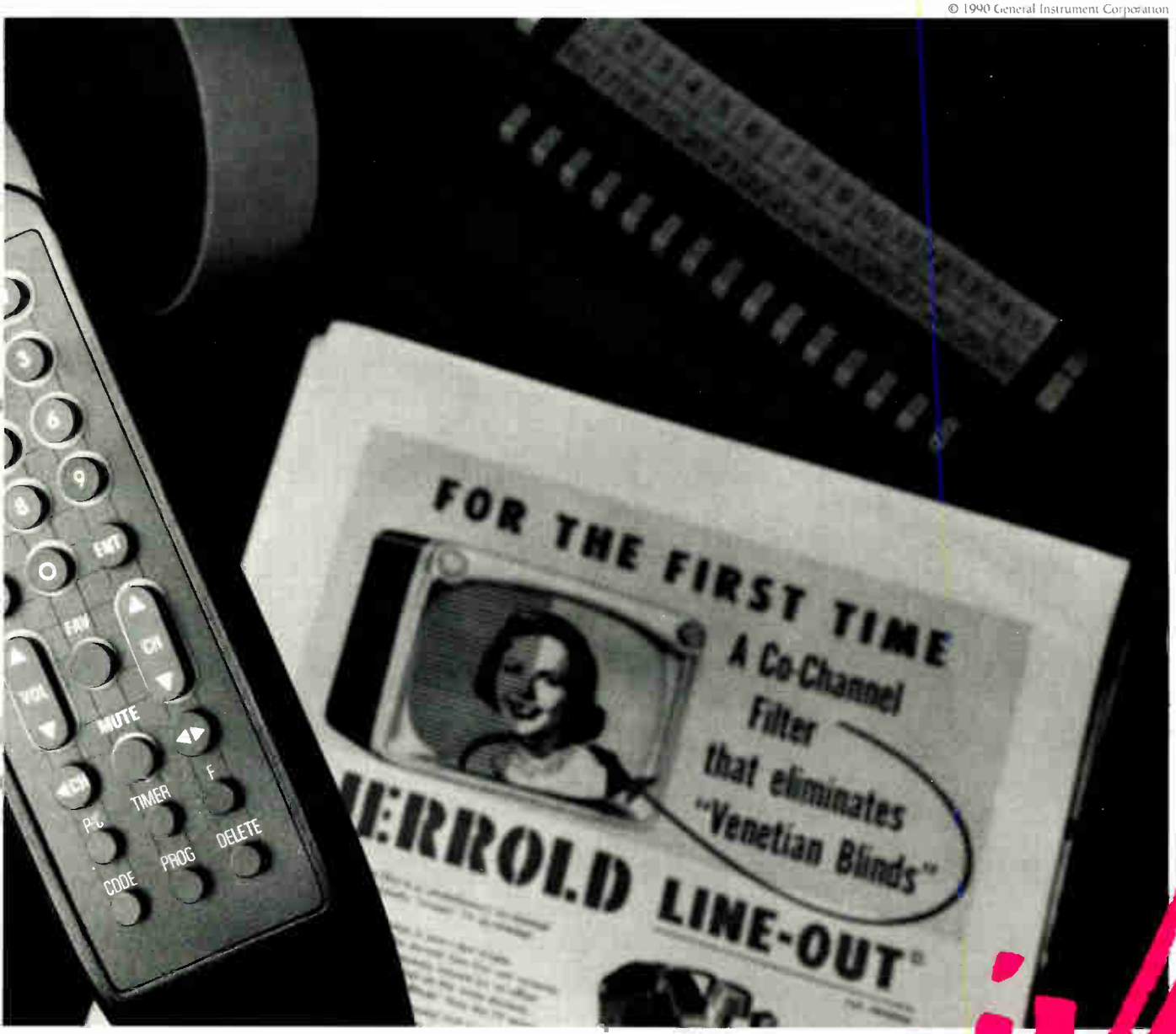

Responsive

JERROLD COMMUNICATIONS

Circle Reader Service No. 43

R&D turns academic in Canada

$3.5 million Labs Fund focuses on long-term outlook

Cable television research and development is on a fast track of change. Historically, equipment vendors have borne the financial burden of designing and building new products, often at the request of cable operators who didn't necessarily purchase the equipment.

A few attempts at organizing R&D facilities within cable operators' internal infrastructures have been made over the years, but those efforts ultimately failed because of cost concerns and problems with the "not invented here" syndrome, among other obstacles.

Cable Television Laboratories found success by focusing on applied research. It's function is to examine new technology and determine how it can be shaped into something useable by the CATV industry. It was also created at a time when technology innovations came fast and furious and the industry needed an impartial voice on the best route to take.

But what about the long-term, more speculative research? Over it's short lifetime, cable television has never been able to focus on the long-term. Consequently, the industry has been blindsided by emerging technology and had to scramble to catch up. For example, the addition of stereo to broadcast television signals almost resulted in a standard that was incompatible with cable equipment. Only an 11th hour action corrected that oversight.

Now, however, that might change. Last June, the Canadian Cable Labs Fund was officially launched with the awarding of its first research grants to three universities in the province of British Columbia. The Fund, although only a year old, promises to be the method by which CATV can benefit from academic research.

If equipment vendors stamp out pieces for the puzzle and the U.S. CableLabs figures out how to fit the pieces together, it might be useful to think of the Cable Labs Fund as the entity responsible for designing the pieces.

So far, this tiny entity has labored in obscurity—somewhat by design. After all, this is the kind of research that does not bear immediate fruit and there's little to crow about—yet.

The origin of the Fund

The Canadian Cable Labs Fund was born out of a Canadian governmental requirement that forced Rogers Cablesystems to offer something that would be of "significant public benefit" in exchange for permission to acquire Western Cablevision. Nick Hamilton-Piercy, Rogers' vice president of engineering and technical services, saw the opportunity as a way to satisfy the government requirement and fill a gap in CATV R&D.

Rogers pooled $3.5 million (Canadian) for the Fund, which has tapped three universities in B.C. to carry out the research (the government requires that all of the money be spent where the buyout took place) projects. John Madden, a telecommunications industry veteran, was chosen as the Fund's executive director. Madden and Hamilton-Piercy together serve as the Fund's directors and are responsible for selecting research projects.

Although no firm timelines have been set, Madden says he expects to spend the $3.5 million (plus matching grants) allocated for research sometime in the next three to five years. At that time, the Fund will be evaluated and if it is found to have provided a signficant benefit to the public, chances are high it will continue on as is or grow into something even more significant, according to Madden. "I'm doing my best to ensure" that significant progress has been made by then, he says.

By taking a low-key approach, Madden intends to have the Fund judged on results, not hype. He'd rather wait until he has something to say before blowing his horn.

But he's adamant about the necessity for academic research and is optimistic about its chances for success. "We (CATV industry) don't do enough of this kind of work," he stresses. "It's not unusual for telcos to invest 2 percent of their revenue in R&D; we're foolish if we think we can do virtually no research and come out ahead." And, says Madden, some projects are more appropriate for the industry to fund, instead of the equipment vendors.

The projects

With the mandate to spend its money in British Columbia, the Fund sought out local universities with which to work. It didn't have to look hard. Madden says he was pleasantly surprised to learn that the universities were keenly interested in undertaking the projects. After a series of meetings, a total of seven projects were selected for immediate funding.

What follows is a brief description of each project and the persons leading the research. The details have been deliberately left out for competitive and patent reasons. (Since the initial seven projects were identified, a couple of additional projects have been funded. Those projects relate to video compression and the use of optical fiber in low density areas. Specific information related to those projects will be forthcoming at another time.)

1. Linearization of optical transmitters for amplitude modulated signals. This $182,000 project headed by Dr. Reudiger Vahldieck of the University of Victoria will examine methods of producing cheaper and better lasers for transmitting AM signals over fiber cables. By reducing the cost of fiber components and improving their performance, it is believed their use would become more widespread. This, in turn, would allow optical fiber trunks to extend their reach toward individual customers and improve signal clarity and service reliability.

2. An expert network analyzer. This project will examine ways in which expert systems can be applied to fault analysis in trunk and bridger amplifiers. It is believed that system downtime would be significantly reduced if these amplifiers could be efficiently analyzed. This $90,000 project is being directed by Drs. Nikitas Dimopoulos and K.F. Li, of the University of Victoria.

3. Compressed carrier transmission on CATV systems. This project focuses on the development of ways to reduce the amplitude of the carrier signal for transmission and then re-

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amplify it at the receiver. It is believed this would enhance the quality of signal reception, however, there are significant technical barriers. The research is examining compressed carrier applications over both fiber and coaxial cable. Nexus Engineering is collaborating on the $100,000 project, which is being supervised by Drs. Jens Borneman and Reudiger Vahldieck at the University of Victoria.

4. Automated cable-TV monitoring systems. The use of artificial intelligence in cable networks promises to help cable operators spot system faults before they actually occur, which improves reliability and reduces subscriber complaints. This project is under the direction of Dr. Rabab Ward of the University of British Columbia's department of electrical engineering. It has been funded with $50,000.

5. Integrated electro-optic modulators and lasers in gallium arsenide. This $45,000 experimental work is attempting to make integrated modulators and lasers on GaAs wafers. It is being directed by Drs. Nicolas Jaeger and Tom Tiedje of UBC.

6. Network evolution, modeling and performance analysis for CATV systems and services. Dr. Bob Donaldson will assist the engineers at Rogers in analyzing the many different technical developments occurring in the marketplace with an eye toward making timely choices for future technical development.

7. Expert information management: A customer service interface. The feasibility of applying a combination of expert systems, natural linguistics and relational database techniques to traditional CATV management information systems is the focus of this research, which has been given nearly $84,000. The intention is to provide a natural language interface to enhance current data interpretation at the customer service level. This research is being conducted by Dr. Nick Cerone, director of Simon Fraser University's Centre for System Science.

Research is examining compressed carrier applications over both fiber and coaxial cable.

In addition to funding their own projects, Madden and Hamilton-Piercy aligned the Lab Fund with U.S. CableLabs (Rogers Cable is a member of that organization and Hamilton-Piercy is a key member of the advisory committee) as well as the Communications Research Centre of the Canadian federal Department of Communications. Also, local vendors (Alpha Technologies, Nexus Engineering) have been contacted for their input. In fact, Nexus was given some "seed money" to help develop and optimize hardware for other uses of the CATV plant (like personal communications networks).

The Fund is the closest thing to a central R&D facility Canada has seen since the demise of the Canadian Telecommunications Research Institute in the early 1980s. That entity, which served as a model for the creation of CableLabs, turned out what has been characterized as brilliant work before suffering from political infighting and a severe recession which forced operators to reduce funding until the Institute could no longer function.

While it is clear the Labs Fund will

not evolve into another CTRI ("It's unlikely other operators would join Rogers," says Madden), there is hope it will at least turn out beneficial results. It could even provide the spark to create a new CTRI, says Madden.

But even if that never happens, Rogers is an organization that could benefit greatly from "coordinated research," Madden says. Because it is so diversified (Rogers also offers local cellular as well as long distance telephony services), "there are some obvious synergies. Our research might be usefully broadened," Madden speculates.

Selection of research projects are ultimately left up to Madden and Hamilton-Piercy to approve, although outside input is sought from a number of entities. Sharing of information comes about through the normal channels (trade journals and conventions), although some form of formal clearinghouse function is being considered, according to Madden.

But Madden intends to use the money to fund results, not a complex organization with costly overhead (remember, the Labs Fund has $3.5 million to spend over three to five years; U.S. CableLabs employs more than 20 people and has an annual budget in excess of $11 million). He and Hamilton-Piercy see no need to compete with CableLabs. In fact, both see the day when the Labs Fund hands off certain research projects to the larger facility in Boulder, Colo.

Dr. Richard Green, CEO of CableLabs, looks forward to that day. "There's already a lot of interaction between us," he points out. And there will be more. There are plans to organize and hold a meeting between the two organizations sometime later this year or early in 1992, says Green.

While the relationship is still in its infancy, Green says it already "works well." He says cooperation results in "a double bonus for us" because the Labs can tap deeper into the academic community (CableLabs already has some university relationships; the most notable is perhaps with the Massachusetts Institute of Technology) as well as apply its own knowledge to the research.

"I think this is a real good match," Green adds. Although CableLabs hasn't to date provided any funding to its Canadian sibling, Green says that day is probably forthcoming. "We may be able to help fill in some areas," he says. "There is a real need for the industry to look at basic research and foster university-level research. This is particularly useful because the work being done (in Canada) is high quality," concludes Green.

While it is too early for the CATV industry at large to gauge the type of research that has been undertaken, it would be difficult to criticize such a bold step as the creation of what amounts to an "academic CableLabs." And while other Canadian cable operators may bristle at the press coverage the Labs will one day generate, it's possible they too may benefit from the research the facility has funded. And when it comes time to construct that jigsaw puzzle of technology, the more the merrier. ■

Acknowledgement

Most of the information regarding the Fund's seven projects was taken from the first issue of *Future Vision*, a quarterly newsletter published by the Canadian Cable Labs Fund.

—Roger Brown

Cable technical training: Americans go where the action is

Cable television is spreading from North America south and across the Atlantic and Pacific. From Taiwan, Japan, Guam and other Pacific Rim nations to England and the continent of Europe, there is a growing need for well trained manpower.

This is music to the ears of American training organizations and businesses that have constructed curriculums, developed training manuals, shot videotapes and videodiscs, and built expertise and reputations. Their business cards could be reprinted to read: "Have training programs, will travel."

One company in the throes of expansion is the National Cable Television Institute (NCTI), the veteran in distance training, offering correspondence courses for the past 22 years. According to Tom Brooksher, executive vice president and general manager of NCTI, "NCTI has such a strong reputation. We're more often in a situation where people are calling us."

NCTI's courses have been available outside the U.S. for a number of years. "We've always done a lot of training in Canada and to a lesser degree in South and Central America," says Brooksher. "There's as much activity in the U.K. as there is with the U.S. operators. We're getting calls from NCTI graduates who are abroad to get cable interests going, or domestic companies are being hired by consortiums outside the U.S.

"We've done a bit of training in the Orient as well. We've done a lot of proposing and assessing the need in other countries from Poland to Turkey—you name it," Brooksher continues.

Where has the NCTI experienced recent increases in activity? "It (actual training) is really starting to pick up in the U.K. Over the next six months, it's going to triple or quadruple," Brooksher predicts.

For the level and type of training available from NCTI, the activity mirrors the status of initial construction. "When a country (decides) it wants cable and figures out who's going to be allowed to provide it, that's when they turn to us. As those people start putting their bids together—just like in this country 20 years ago—being able to substantiate that they're going to build the system and maintain it with qualified people becomes part of the franchising process, whether it is a franchise process like we have here or some other government regulated process. At that point, they start turning to us," Brooksher says.

Then NCTI attempts to assess operators' needs and fulfill them. "We have a lot of situations where people come to us and say, 'We need you to take our mid-level management people that we are starting to hire now who will then hire the technical workforce.' Maybe they are going to come from broadcast television or some other electronics industry. We just teach them cable television," Brooksher explains.

By George Sell, Contributing Editor

Ready resources

"We set up NCTI International as a stand-alone division that would have immediate access to our overall training resource. We have more than 200 lesson modules already developed and in use on basic cable television technology. We have this tremendous library that we can draw from. Some of it will be applicable and some not," says Brooksher.

For example, a cable system in the U.K. cannot use NCTI's installer course exactly the way a cable system in Connecticut would because their needs are different. "We teach pole-climbing but there are no poles to be climbed (in the U.K.)," Brooksher notes.

But the NCTI has discovered that what it is doing here, for the most part, does apply across the Atlantic. "By doing some sensible picking and choosing, what we've done is create a course called 'Installer International' that's being used in U.K. systems," says Brooksher.

But what about foreign languages? When there is a full blown language difference, such as Japanese or Portuguese, is it merely a question of translation? "If you are training upper level management, in a lot of cases they are English speaking people and you go with the material you've got. When you start training the masses, that's a whole different situation. We just have to figure out what they want and then look at what's practical," Brooksher explains.

But most often, according to Brooksher, it boils down to a generic translation. "But you have to have somebody who understands what is being translated and make sure it makes sense and describes the concept."

Even unique national technical standards have not presented problems for NCTI. "NTSC and PAL have fundamental differences. But the vast majority of what we are teaching happens before you're dealing with television sets." Course supplements usually do the trick, Brooksher points out.

"If a new country next week announces that they are ready to start accepting bids for cable franchises and yet they don't have standards set, that's not much of a detriment to us," Brooksher explains, "Because we can say, 'We can teach you guys how a basic cable system works in the U.S.' and as standards are set, and if they shift a bit, you've got the basic knowledge and you can add the details of the standards after that.

Exporting BCT/E

In terms of technical education and certifications awarded at the completion of courses, NCTI's Brooksher reports, "At this point it's really a 'wild, wild west' out there." Completion of the course work provided by the NCTI serves as a *de facto* certification.

"(Our certification is not) like (the SCTE's) BCT/E certification," says Brooksher. We are often asked, 'How does this compare to the BCT/E? Which one should I do?" In response, Brooksher draws an analogy between the BCT/E, for cable techs, and a CPA for accountants. He sees NCTI training similar to a college degree. "Once you get your college degree, you've got your educational training under your belt. If you want to be certified, you've got to be in the field for so long, have professional references, go through a testing process. That's the BCT/E."

"One of the things (other countries)

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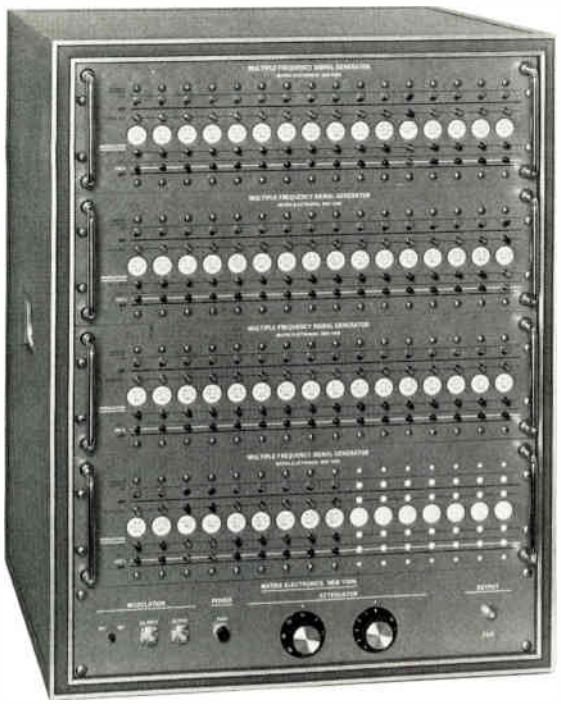

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SCTE: Organizing begets organizing

In the course of organizing the International Council, the U.S. SCTE leadership has seen the emergence of some positive side effects which may have far reaching impacts, especially in Canada and the United Kingdom, and, perhaps, over the long term, in other parts of the world, most notably in the Far East and South America.

When Wendell Woody, president of the U.S. SCTE and the guiding light behind the International Council, approached Canada seeking their involvement, the question of Canadian national representation was immediately problematic. There was no national body of the SCTE in Canada.

The SCTE International Council at the 1990 CTA Show in London.

"There's a Western group out of Vancouver, an Ontario group in Toronto, a Quebec group and the Maritime group out East. They function more like our chapters down here but they don't have any controlling body over the whole works at all," Woody recounts.

William Riker, executive vice president of the U.S. SCTE, gives the historical background: "The Canadian SCTE use to be our 13th Region. They broke away in the early 1980s to form their own, mostly over disputes on representation on the Board here and member dues and that type of thing." Then internal difficulties led to the four autonomous Canadian organizations.

"So, Woody went up there and mentioned the International Council and that we would like to get a single voice from the Canadian SCTE participants on the Council," Riker reports. "And that was really the motivation for them to start talking to each other and jointly appoint representatives to serve on the Council."

"We took the very same structure that we were using to set up the International body and started to unite those four Canadian groups together," says Woody. He says the intent was not to merge them, but to give them their own National Council that would give them some control over each other or guidelines. The first thing I asked them to do was to give us some people to sit on this Council.

"We got all that completed last year. In fact, at the Canadian National Show in Ottawa this year they had a meeting of their National SCTE Council and they ratified some people to sit on the International Council and laid out structures for what their goals are to help each other across Canada. The Canadian Cable Television Association is underwriting the costs for (the National Council)," says Woody.

Canadian SCTE developments

Woody is elated with this development. "I'm happier with the Canadian thing than almost anything else I'm doing right now because here's a group that's really growing now. They're gung ho to get their organization going strong."

Woody sees this as possibly leading to a greatly expanded Canadian SCTE. "If their National Council (can) agree to be the main strong body, (they could) then decide that those four groups should be called chapters and then set out to go for a lot more chapters so that they could better cover the geographical area.

"There's less than 1,000 people in those four groups combined. The Maritime group has less than 50 members. It's more like talking to a chapter than talking to a national organization," Woody adds.

Impacts in England

"There's a different situation altogether in England," Woody continues. "That's not a training Society. So, even though they are committing to this program and the fact that training is one-third of our international concept here, they've got a long ways to go before getting involved in training. They haven't made as much progress toward training this year as Canada did as far as moving toward getting organized. I'm still supporting groups to move toward the training concept.

"The SCTE in England used to be the Society of Relay Engineers because most of the work was using translators to distribute the BBC programming throughout the country," Riker explains. "They then evolved into cable television engineers. It is a group of senior level folks. You need to have a degree and be recommended by engineers who are already members of the

SCTE. It's an elite group that has meetings once or twice a year."

Change comes slower in traditional professional organizations. "There's probably mixed emotions in that group as to whether they want to keep it the way it is or move it into a training type society similar to ours," says Riker. "Some of the newer members would like to see it become open to everyone involved in the industry and turn its focus from being a fraternal organization to an educational organization. We are certainly there to help them do that if that's what they decide they want."

England needs manpower

There is an immediate need in England for trained manpower. "They started looking at where to get engineers and technicians," Woody observes. "They decided they either import them from America or Belgium or train them over there. But where would they be trained? Well, they don't turn to the Society of Cable Television Engineers because it's not a training society."

Some people are pushing hard and may want to go even further than the United States. Some want to lease office space and create a school. Others may not mind getting into training but are reluctant to openly admit new members.

"One thing that's helping it change is that the (U.K.) Society is not self-sustaining from a financial standpoint," Woody explains. "The CTA funds it." Little income is available from membership because very few are dues-paying members. And they have only one annual meeting.

"The CTA money is very important to them," Woody suggests. "So, the CTA is one group we're also working with from here."

Structural expansion

Woody's suggestion has been to expand the structure of the current organization. "What they need to do is take the present Society and make the membership a grade like 'Engineering Fellow' and go through the same ritual for how you get to that (level) but open up and restructure the whole society and have it a training society where anyone interested in the business can be a member," Woody proposes.

Positive steps in this direction have already taken place. The U.K. SCTE's Secretary Tom Hall reports in the March/April edition of Cable Television Engineering Magazine, that a new grade of technician member has been created. This will extend the benefits of the Society to these professionals and give an added financial boost to the U.K. SCTE.

> Groups from all over have expressed the desire to participate in the International Council's activities.

Elsewhere

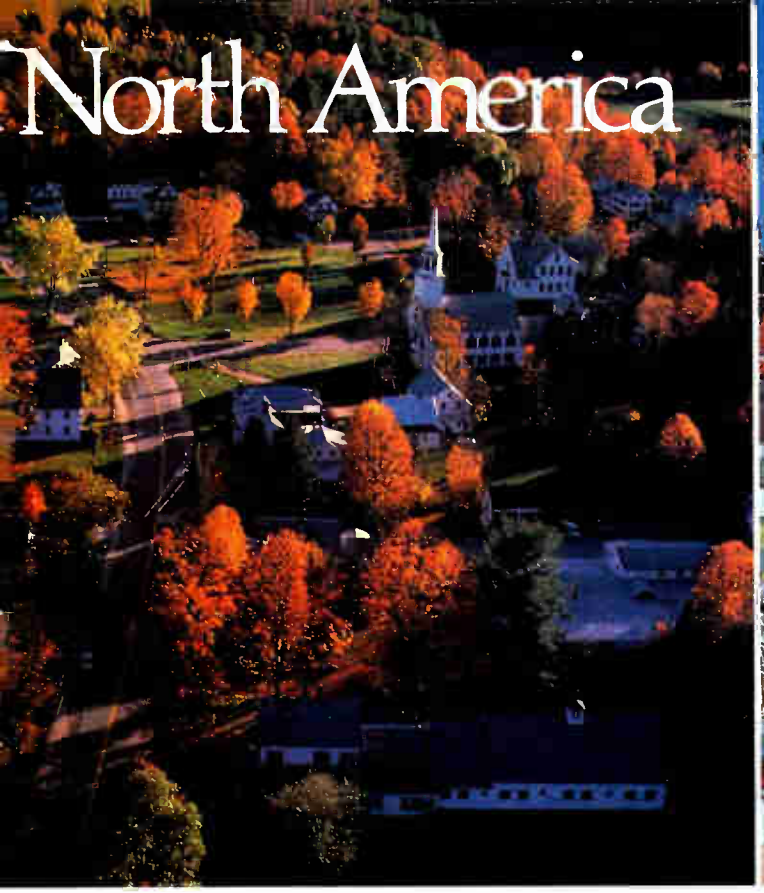
Since there are only three countries that have officially recognized SCTE organizations, the membership of the International Council has been limited to representatives from those three countries. However, groups from all over have expressed the desire to participate in the International Council's activities.

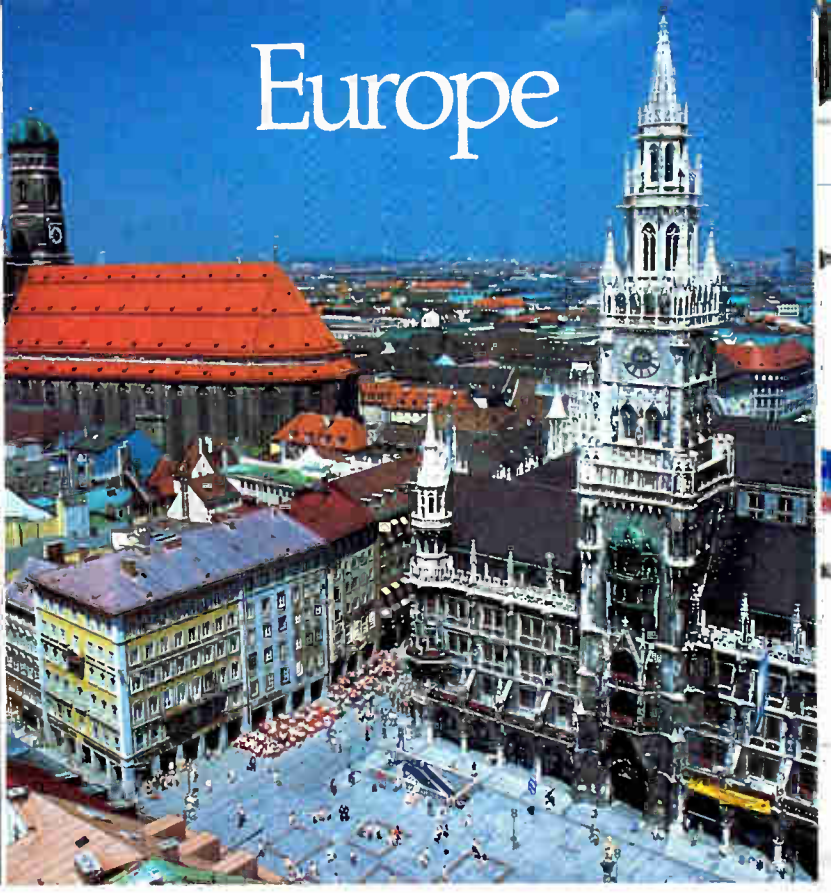
This fact may, down the road, spawn new national SCTE organizations. "What we have committed to do is help other countries start their own Society which would be completely separate from our own and then invite them to participate on the International Council as they so desire. We would then make our training materials available to them for translation and usage on a reciprocal basis," Riker explains.

"We had 33 members of the EIAJ, which is the Electronic Industries Association of Japan at our Expo in Reno. We had a private meeting with them," reports Riker.

"Argentina has asked that we start an SCTE down in their country as well. Japan and Argentina are the two that have come to us, and in both cases we have told them we will help start new SCTEs. Under that scenario the U.S. SCTE would give them everything they need but wouldn't require the group to be a direct part of the Society in this country.

—G.S.





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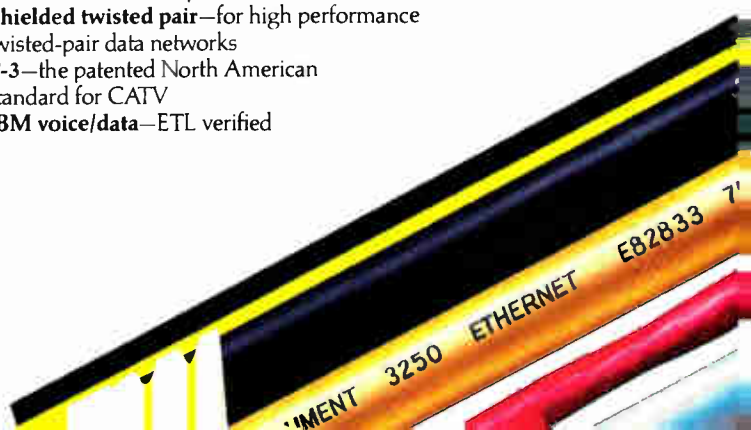

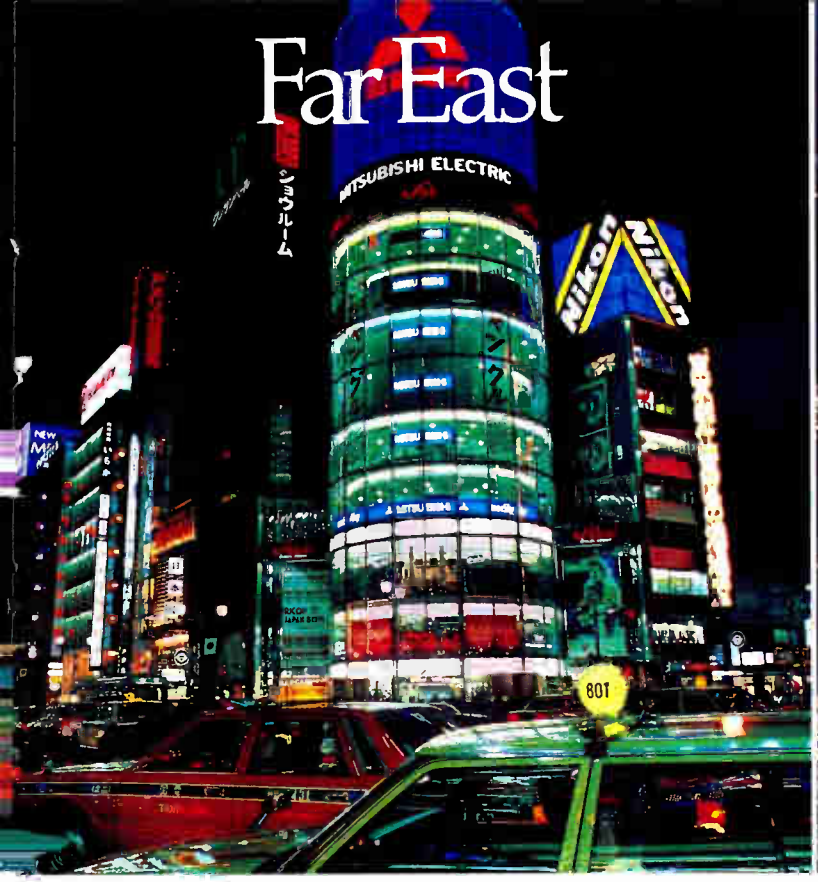

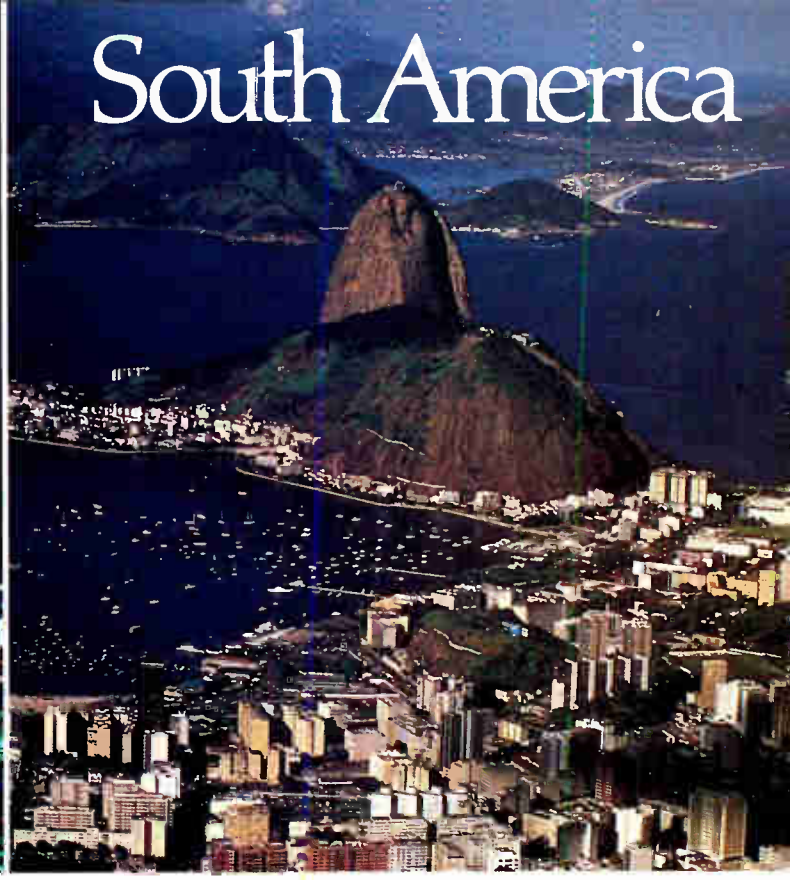

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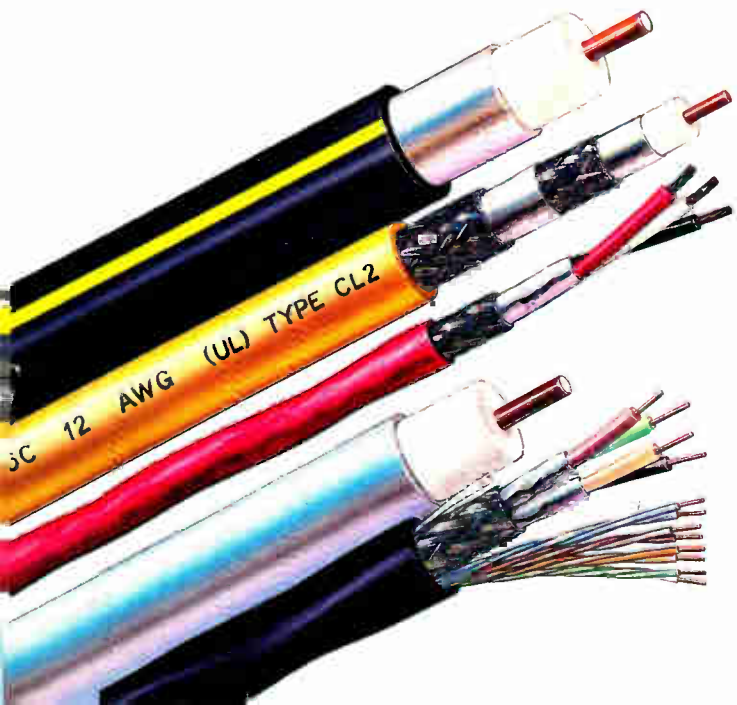

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are so envious of is our certification program," says SCTE President Wendell Woody. "Canada's SCTE is a training society but they don't have a certification program. The Western Canadian group is doing something to certify through a trade school but it's not recognized. They would like to move to the point where they would be able to join in our certification program sometime.

However, exporting the BCT/E certification program to countries other than Canada is a long way off in the future for the SCTE. At this point what the NCTI is doing is often the essence of certification. "Internationally, they want to say, 'Our people will be trained by the people that are responsible for training the top cable company employees in the world,' " which right now are in the U.S., says Brooksher.

NCTI's president, Byron Leech, adds a note of caution, however. "All American companies need to understand that we are not necessarily the end all for these folks. We have to take into consideration their own specific needs. We worked with a program in Turkey and found out, quite frankly, that it was going to be pick-and-shovel people. I don't mean that to demean them at all but I said, 'I know you guys are all English-speaking engineers but let's talk about house-to-house and manhole-to-manhole. These will be uneducated pick-and-shovel people that are going to be doing this. That means we have to consider how we will educate those people.'"

William Riker, executive vice president of the SCTE, also urges due respect for those of the host countries. "In the U.K. they are very anxious to share in the knowledge from this country. I sensed from the last time I was over there that they were somewhat apprehensive of us coming over and basically running the show. There are a lot of cable companies going over and saying, 'You guys just stand back and watch us work.' They don't want that. They still want to be in control of what goes on over there. But they are most anxious to not have to reinvent the wheel and take advantage of the work that's already been done in this country."

Another person urging the use of a sensitive approach is Connie Buffalo, director of educational development at the Mind Extension Institute and developer of its interactive videodisc-based training programs. "The training scenario that was painted for me in the U.K. and parts of Europe is that we take for granted that people who come in have a technical awareness. That awareness may not be as prevalent in other countries. That knowledge is just not as broadly available as in the United States.

"So when we go over there we have to be more sensitive to their culture," Buffalo stresses. "One thing we want to do as we start moving overseas is to listen a lot to the people—what their learning styles are, how to communicate, that sort of thing. And we have to make sure our productions are done in their homeland so we're really sure we are maintaining integrity for how they process data."

The gift of other cultures

"We, as Americans, have a tendency to stumble over the gift of other cultures," Buffalo laments. "We go in and say, 'Here's another way of doing it and how about if I help you adapt to the American way?' We have an opportunity as a cable industry to go in and respect the gift that they bring, too.

The gift that Buffalo and the Mind Extension Institute bring is its "Installer Training and General Safety" videodisc-based instruction method. This interactive approach, already well accepted in the U.S., is going overseas. "We've had requests from the U.K. and Canada as well as South America to do adaptations and translations," Buffalo says.

According to Buffalo, doing adaptations is not just overdubbing. "I wish it was that simple. For example, in the U.K., where people drive on the opposite side of the road, they don't have aerials, the cable is a different color, so it's a lot of reshooting. There's a lot of differences in requirements and the way they install."

Buffalo has had inquiries from the Asian market as well. "The inquiries were from China and Japan. We haven't been approached by Guam. The potential is being recognized by a number of people," Buffalo adds.

Like Brooksher at NCTI, Buffalo sees a need for basic information. "There is still that demand right now for all the basics. The good news is we have a lot of that defined with Installer Training and General Safety so that we have a launching pad in training based on the material that we have already assembled here. So, that creates a point of departure and then we go into the enhancements. We are

doing advanced technical training in this country that will then be the foundation piece for our overseas work."

ATC's training center

Another abundant resource for international training is ATC's National Training Center in Denver. Although its mission is primarily to meet the internal manpower needs of ATC, the expertise, course materials and facilities are available for training anyone domestically or internationally.

"We train, currently, around 1,000 students a year," says Ron Wolfe, manager of the operation. "And in addition to classroom training, we do training in the field as well. We have instructors traveling the country on a regular basis. Most of that travel has been within the U.S. so far."

The ATC Center has been active for 10 years. "We also have a six-volume set of training manuals that were written here at ATC over the years that span topics from installation up through chief technician. We are adding fiber optics now," Wolfe adds, "because that's a recent development in terms of manpower needs."

ATC's Training Center also has a videodisc-based interactive program on trouble-shooting that Wolfe will be taking to the London CTA Show. Wolfe explains: "It's generic enough in terms of its approach that it could be used in any kind of network."

The Center also offers short duration seminars. But on the other hand, the core curriculum that the facility was built around involves prerequisites *and* out-of-class electronics study done through the Cincinnati Institute of Electronics (CIE) and NCTI.

"That's a little more difficult to do," Wolfe explains, "because there's a big learning curve to get familiar with that program. And it's something that takes a fairly long-term commitment. That program is designed to be taught over a four- to five-year period."

Such a commitment may not be possible for many overseas trainees to make at this point. "You don't, very often, find somebody who's willing to commit to training a given individual over a four- to five-year period."

Aside from some talks with Taiwan representatives, to date the Center's international activities have been limited to Japan. "Most of our international work in the past has been involved with different Japanese companies," Wolfe explains. "Every year over the past five to six years there's a group of folks who come over that are system operators from Japan. They come over the week before the National Show and we bring them into the Training Center and run them through a seminar that is really a familiarization with the cable business in the United States. It covers everything from programming, sales and marketing, finance, engineering topics, anything that they want to do.

"That's been a real good program for us. We've gotten some real good feedback from that," Wolfe reports. "They call it a 'seminar tour.' They then pop out to a couple of our divisions, walk around and kick the tires, and ask questions of everyone from the CSRs to the headend techs."

ATC's got some good resources for that. "It's nice to be able to pull on some guys like Jim Chiddix and Dave Pangrac to come in and spend some time with those groups," Wolfe adds. ■

CATV cables, they can do more!

Author's Note: *Belgium, which has the highest density of cable TV subscribers in the world, started building cable TV networks on a large scale approximately 20 years ago. This means that most of the networks need to be upgraded over the next few years, for several reasons.*

Since the coaxial cable is already in place, why not take the opportunity to investigate the possibility of using this cable as a means of transition between the present telecommunications environment and the broadband ISDN approach? This automatically means interactive applications (two-way), more than just one-way audio and video.

With these considerations in mind, our company equipped a part of the Teveoost network (a large network we run together with several municipalities in East Flanders, Belgium) for two-way operations (involving 1,500 subscribers).

The Eeklo-Maldegem multi-service project in the Teveoost cable network was launched with a multiple purpose, namely to:

- acquire experience in the practical upgrading of the existing cable network to a 450 MHz two-way network while safeguarding the existing network structure;
- evaluate the technical problems of two-way communication on a cable television network with a tree-branch structure;
- set up a communication protocol for the service providers and subscribers;
- conduct a representative sample survey and assess the economic feasibility of a number of multi-service applications.

Choice of test area

Right from the start it was assumed the pilot project would be aimed at general public applications and not at professional applications. Therefore, areas were selected where, at short distances, a reasonable sample survey could be performed for all layers of the subscriber population.

Moreover, to guarantee a representative test field, two residential areas were chosen at a great distance from each other (7 km) with the second center lying some 15 km from the central antenna station.

Furthermore, all types of networks had to be present in the relevant test fields, i.e. aerial network "on facade" or poles and underground networks with connections in pedestals. The final choice fell on the communities of Eeklo and Maldegem, where two specific zones were selected because they met all the criteria with a total of 1,500 potential subscribers. (See Figure 1, which gives a schematic diagram of the test fields and the primary trunk.)

The projects were carried out with the planned upgrading of the networks to a bandwidth of 450 MHz. The coaxial cabling remained in place and unchanged as much as possible, but the gain of the amplifiers was adapted to the new bandwidth.

The two demarcated zones in Eeklo and Maldegem have been fully upgraded: all subscriber taps were replaced by Eagle 600 MHz taps; the Siemens GGA3 line extenders were replaced with Siemens GGA45 devices with an active return path; and the trunk amplifiers were replaced with Siemens GGA4 amps with passive or active return paths.

For data commununication, the frequency band in the forward path is reserved from 70 MHz to 86 MHz. The full return path is provided for between 5 MHz and 25 MHz.

From initial experience it appears that the additional cost to equip the existing cable network for two-way communication represents on average an additional 20 percent to 30 percent on top of the cost to upgrade to 450 MHz, depending on the type of construction of the network.

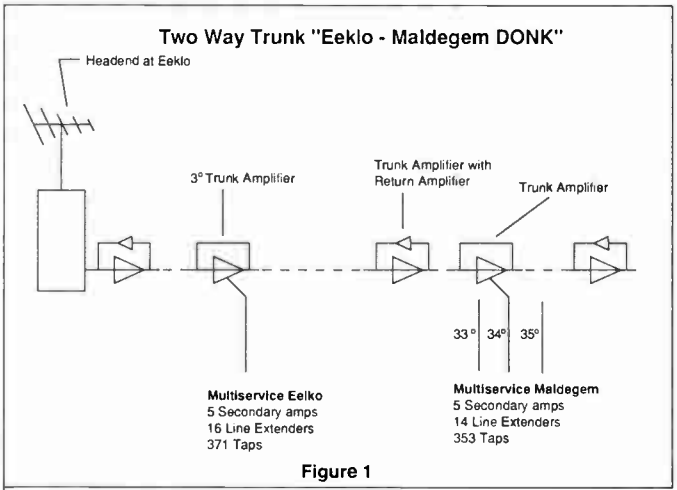

Figure 1

Technical evaluation

The group delay characteristic. Because of the influence of the cross-

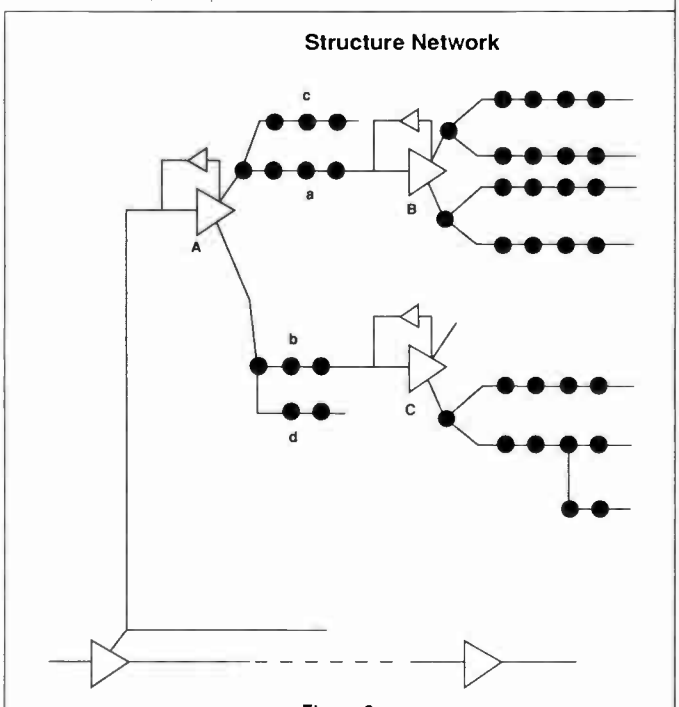

Figure 2

By Norbert De Muynck, Piet Lemaitre and Maurits Van De Voorde, Electrabel

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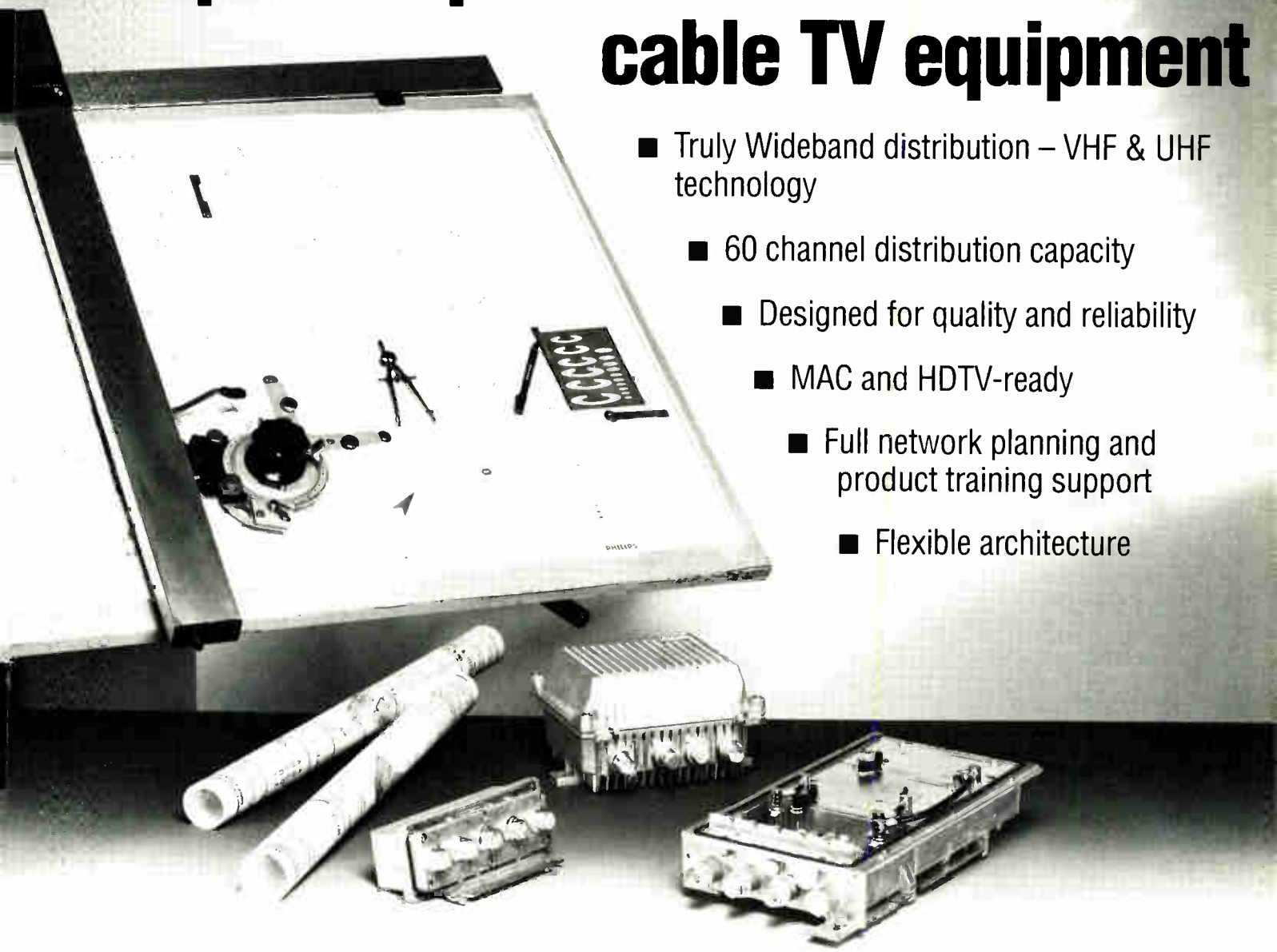

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over filters, there is not only an unusable spectrum between 25 MHz and 46 MHz, but also a group delay error is caused in the forward path from 47 to 55 MHz. The influence of the delay is felt on the response of the E2 and E3 TV channels. For a cascade of 40 trunk amplifiers, the group delay error in the return path above 21 MHz is greater than 300 nanoseconds per MHz. Therefore, data traffic above 21 MHz must be reconsidered.

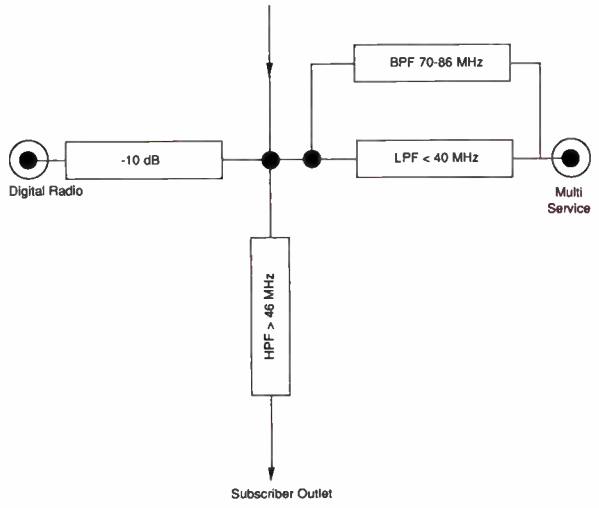


Figure 3

In the distribution network, there is no problem because of the reduction of the cascades to four amplifiers. The limiting factor for the group delay time is therefore the trunk network.

The return path network adjustment. Practice has shown that the adjustment of the return path network causes problems (see Figure 2). The cable network is developed from the point of view that the forward path network losses play a far greater part than in the return path.

Since distribution lines are divided by means of splitters and individual control devices are missing, the "longest electronic RF path" to the return amplifier for each distribution line must be determined. The longest path is what determines the gain setting of the relevant return path amplifier. The output level of the subscriber RF modems is (automatically) adjusted so that the level of the carrier is always 20 dBmV on the output of the reverse amplifier.

In the case of amplifier cascades, there is the problem in that the longest electronic path is not always the distribution line of the cascade, e.g. line A or line B (see Figure 2) but an end line, such as line C or D.

To adjust the level of the active lines, an adjustable attenuator is provided on the output of the reverse amplifiers so that the electronic length can be adapted without changing the standard output level of 20 dBmV on the amplifier.

Signal splitting in the home. As the RF modem sends back the return path signal on the cable network at a relatively high level, spurious signals on the TV receiver cannot be excluded during transmission. To cope with this problem, the following splitting is proposed (see Figure 3):

- The multi service terminal/modem is connected to the cable network via a low-pass filter for the return frequency and a 70 MHz to 86 MHz bandpass filter for the forward channel frequency.
- In anticipation of the development of digital radio, a second broadband output is provided with a 10 dB attenuation.
- The conventional subscriber outlet is then linked to the third output via a high-pass filter.

This network of combined high- and low-pass filters prevents the strong return carrier from causing spurious signals in the TV receiver. Simultaneously, the same filter prevents cabling faults in the subscriber's installation to cause ingress of signals in the return path.

To avoid ingress problems at those subscribers who are not connected to a multi service application, the installation of a high-pass filter is provided on the relevant output of the subscriber tap.

B.E.R. measurements. After the realization of the two-way structure, a Bit Error Rate measurement was performed on a test signal of 19.2 Kbit-BPSK. The first modem was set up in the antenna station in Eeklo and the second in the most remote point in Maldegem. At standard level both in the forward and return path, the following results were recorded: C/N = 45 dB - BER = 0. Subsequently, the signal of both transmitters (Eeklo and Maldegem) was decreased with the following results:

Level (dB)	C/N (dB)	BER 10^{-6}
-8	37	4
-14	31	12
-20	25	100
-30	15	∞

We therefore believe that the technical feasibility in the cable network has been demonstrated.

Implementation of multi service

To test the public interest for two-way services, the last phase is most interesting. Three application groups were proposed: alarm application, information consulting and pay television. These three groups have been recognized by recent market research both in the Netherlands and in Belgium as the most popular services. More about this later.

In the first phase, a test was set up with the implementation of social alarm, security alarm and impulse TV for 50 subscribers. Without going into the technical details, the full test set up consists of:

- The service computer providing the scanner with the necessary data. Moreover, the service computer acts as a database to receive alarms and technical data and possible shortcomings of equipment or cable network (see Figure 4).
- The equipment set up in the Eeklo antenna station. This includes the Smart Cable Scanner (SCC), which controls all of the available functions of the management system and manages data communication with all participants.
- The standard domestic equipment (for 50 homes). This equipment is placed in each home and consists of two parts: A metal housing for the Smart Cable Panel (see Figure 5) and a second housing for the keyboard, usually located in the vicinity of the TV set (see Figure 6).
- Extra equipment in the home for the security alarm function for basic protection (25 homes).
- Additional material for access protection with passive infrared and smoke detector, including key operation for the burglar system. Additional extra equipment for 10 high-risk homes.
- Extra equipment for the social alarm function (25 homes). Consists of a personal alarm receiver with antenna and battery monitoring as well as a personal alarm transmitter with bat-

The Pat

NTSC AND CATV IMPAIRMENTS

The traditional NTSC signal, though incredibly robust, has its sho service for 50 years and often shows its age. As television receive resolution capability, these shortcomings have become the limitin Some of the most common artifacts and distortions include the fo

Photo courtesy CableLabs/Jerrold

Ghosting

Perhaps the most annoying artifact, ghostin caused by signals reflecting off buildings mountains, etc. and arriving at the televisi receiver twice. This results in multiple imag being layered on top of one another.

Original signal

Signal with g

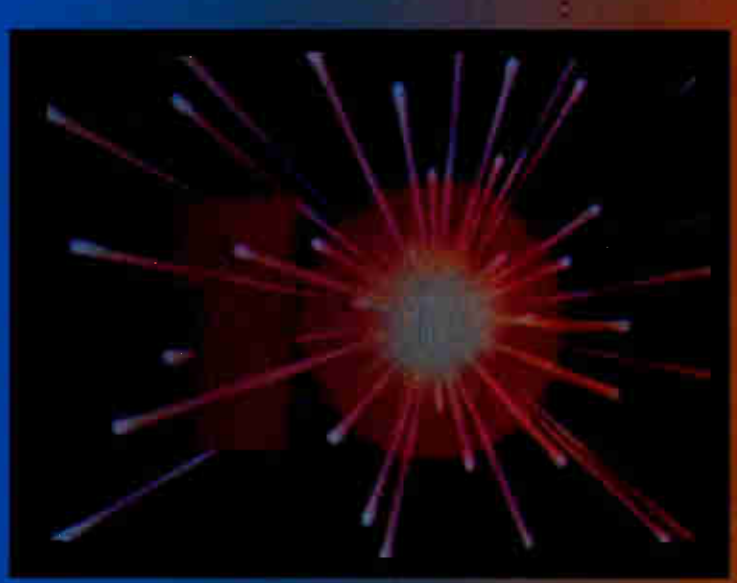


Photo courtesy CableLabs/Jerrold

Dot crawl

When two color blocks come in contact with another to form a vertical line, a line of "dots' often seen running toward the top of the scre

Cross modul

This signal distortion is defined as an unde signal being superimposed onto a desired si with results similar to adjacent ch interference. It is caused by a damag misaligned amplifier that transfers or "cros two signals. It appears as slanted bars wiping effect caused by the interfering pic

Photo courtesy NCTI

Co-channel ingress

When two video signals of slightly different frequencies occupy the same channel, a patte of stationary dark and light horizontal bars appears. It can be caused by ingress on non phased-locked cable systems or off-air ingres IRC systems.

HRC in

Off-air signal ingress on HRC cable sys results in a pattern of either moving or stati diagonal lines on the receiver's sc

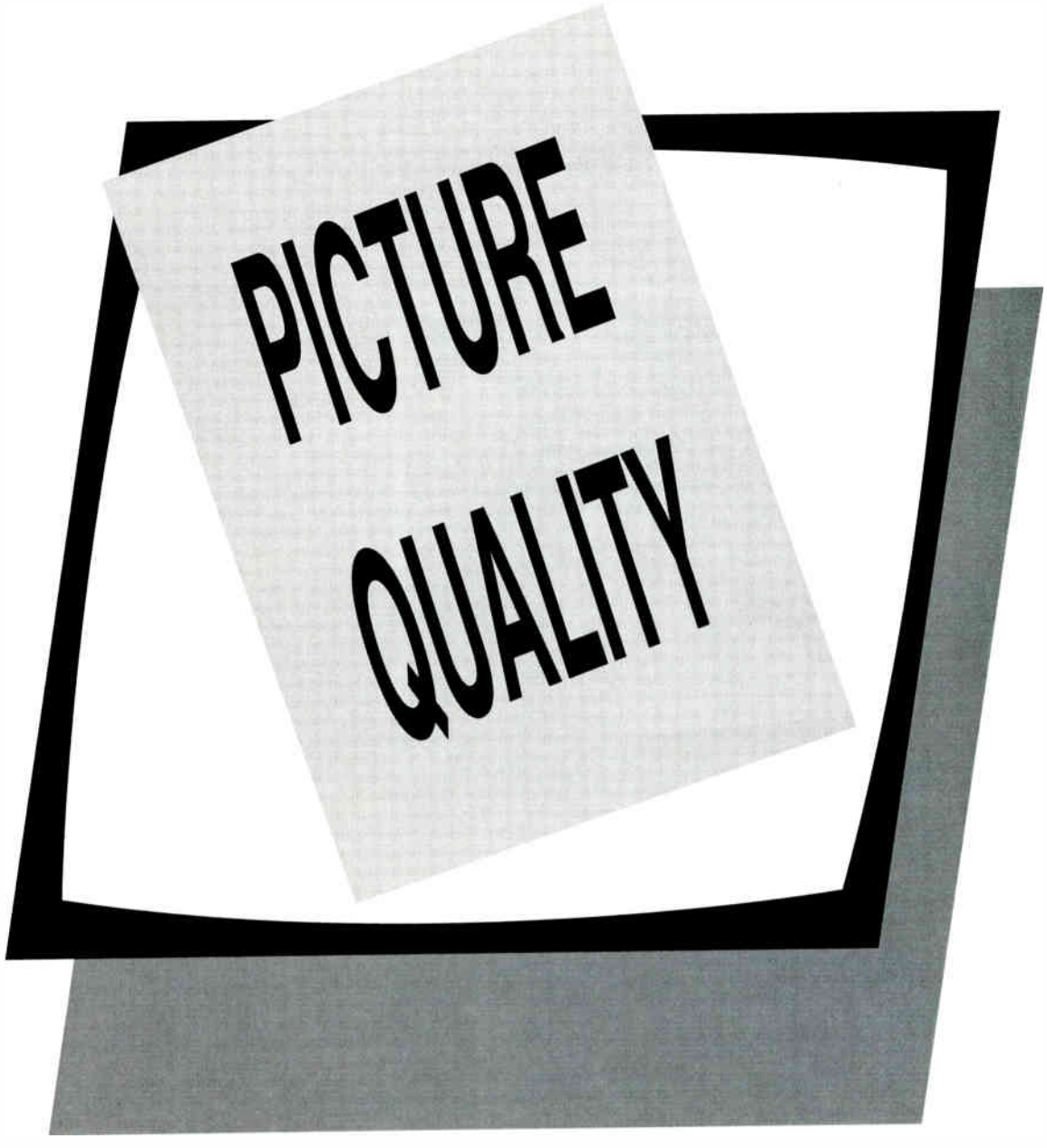
Photo courtesy NCTI

Composite second order/composite triple

CSO and CTB are CATV-related impairmer caused by the non linear operation of an amp Second order distortion is the result of th addition and/or subtraction of two frequen and appear as thin, parallel diagonal lines sl moving across the television screen. Third c or "triple" beats are the result of the additi and/or subtraction of three frequencies ar appear as a busy background, similar to a gr or noisy picture.

Making television pictures better

A pull-out wall chart



It's no secret that video technology is undergoing a revolution. What was considered impossible just a few short years ago is now commonplace. Similarly, the picture quality offered by cable-television networks is improving radically with the advent of fiber optics and digital transmission of signals. This chart is designed to educate CATV technical personnel by showing a variety of NTSC impairments and explaining how they are caused. In addition, it shows how cable's pictures have improved over time via improved carrier-to-noise ratios, better television components and the advent of digital equipment.

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Photo courtesy CableLabs/Jerrold

Photo courtesy NCTI

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Photo courtesy NCTI

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Photo courtesy CableLabs/Jerrold

CARRIER-

**Fiber optics offers ca
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**Former minimum signal perform
adopted by the Federal Commu
Commission. Viewed by many t
unacceptably low performance l**

NTSC IMPI

**Although the rush is
improved before it's a
internal filtering and
virtually eliminate imp
photos below show h**

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ved Picture

TO-NOISE

ble operators many benefits, but the one most visible to the subscr
nt of noise accumulation in a system.

Photo courtesy CableLabs/Jerrold

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Photo courtesy CableLabs/Jerrold

43 dB C/N:
A typical average specification which most coaxial-based cable systems were designed to deliver. Provides good quality video.

Photo courtesy CableLabs/Jerrold

49 dB C/N:
Made poss
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High Defin

ROVEMENTS

on to implement HDTV, some believe NTSC should be
bandoned. Devices such as line doublers and improved
ircuitry offer dramatic improvements in resolution and
airments such as dot crawl, ghosts and noise. The two
ow NTSC television can be made to look better.

NTSC and Advanced Compatible Television I
These photos show standard NTSC pictures photographed from an actual TV screen contrasted with the better resolution offered by more advanced versions of NTSC-compatible systems. The top picture is NTSC. Note the ghost around the fruit, the herringbone pattern in the corn as well as the general fuzziness of the picture. The bottom picture is Advanced Compatible Television I, developed by the David Sarnoff Research Center. Note how "clean" the picture has become. (ACTV also provides a wide aspect ratio picture. However, other improved NTSC systems such as Faroudja's SuperNTSC, offer comparable results without changing the size of the picture.)

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Photo courtesy CableLabs/Jerrold

High
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Quality

ber is improved picture quality. This is primarily achieved via a

ible with the advent of fiber optic-
orks. Considered by some to be the
pecification necessary for delivery of
tion Television.

Photo courtesy CableLabs/Jerrold

53 dB C/N:
Noise practically disappears from picture. Quality is comparable to that delivered by analog laser videodisc players.

IGITAL TRANSMISSION

e advent of digital transmission of video over cable networks
mises to deliver the same high resolution picture to the
oscriber that is viewed by technicians in the cable system
adend. Digital transmission, once viewed as expensive and
necessary, is gaining favor with of the advent of digital video
mpression.

Photo courtesy CableLabs/Jerrold

-quality in . . .
is the type of high-quality picture cable
hicians see in their facilities.

. . . high-quality out
This same high-quality image can be displayed at the viewer's television with the advent of digital transmission.

CED

CED magazine, 600 South Cherry Street, Suite 400, Denver, Colo. 80222.

tery monitoring.

The timing for the installation of the equipment was fixed for the end of June 1991.

Marketing approach

In Belgium, a start will soon be made with the replacement and modification of the existing cable infrastructure. In this context the introduction of new technical capabilities is being envisaged. These include the so-called two-way applications, which will allow network subscribers to actively communicate with a wide variety of information and service providers. These facilities will be made available against payment, exclusively as a function of the extent to which one wishes to make use of the system, the fee being determined by the source of information and the service involved. Depending on the facilities to be incorporated into the network, this implies an investment cost which could be one-and-a-half times as high.

To investigate this hypothesis, a trial network was set up in the Maldegem-Eeklo region to test the technical feasibility of two-way communication in a tree-and-branch structured network.

It is clear that before any further investments are made, an in-depth market research is required, so that the right decisions can be made (concerning the services to be made available).

Market analysis and research

Desk research. Desk research is a very important and vital activity. At present, many activities are being developed independently of each other in all parts of the

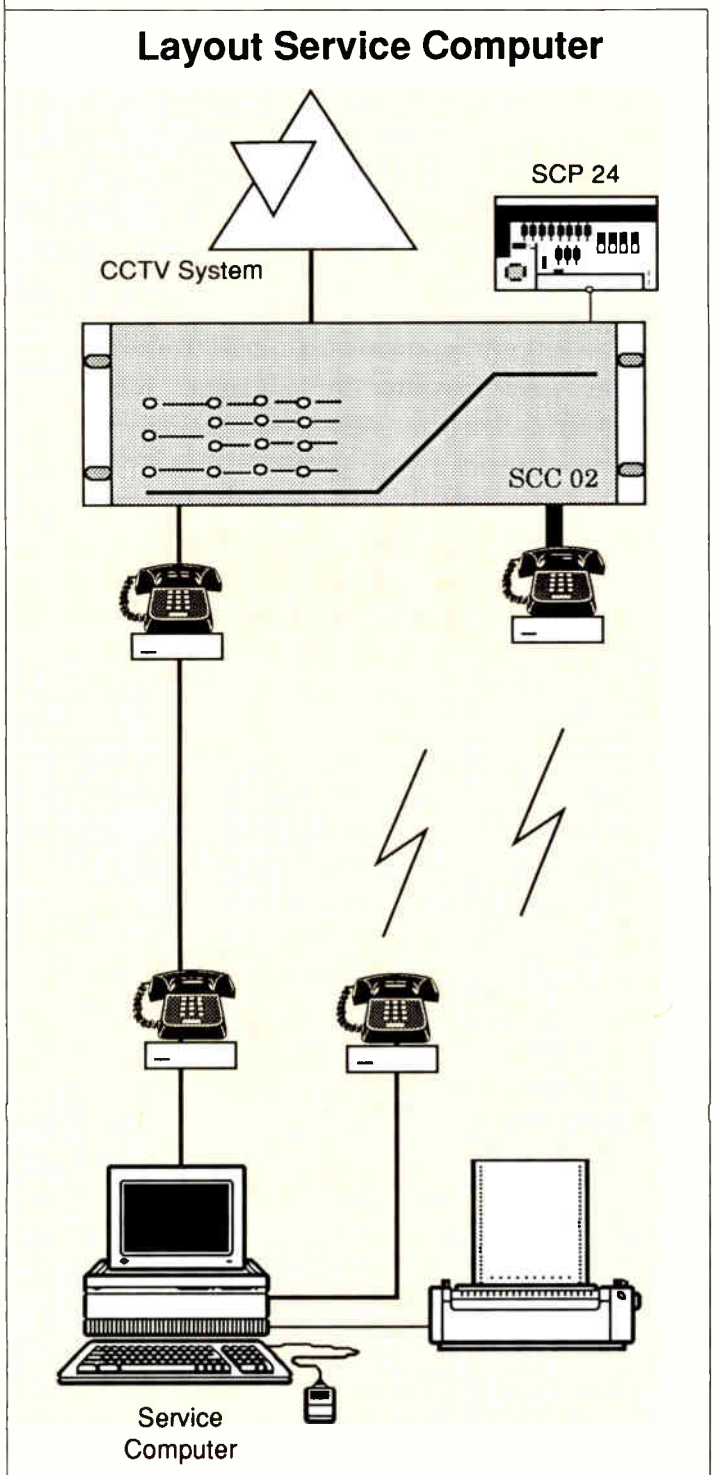


Figure 4

world. Desk research aims to coordinate these isolated initiatives into one whole.

Market research. Based on the problem definition, market research should enable us to find answers to the following questions:

- Which services need to be incorporated into the cable network if two-way cable distribution is to have a meaningful market penetration? How many people are interested, what are their specific interests or activities, and what are the respective frequencies? How much are they willing to pay for it? How do we define and delineate the product concept as a function of the needs and wishes of the targeted groups? How do we verify the marketability of the product concept before any further developments are made?
- How are we going to market the defined product concept? Not only do we need to know which technical services we can offer to our target group, but also the way in which we should address our target group to convince them of the relevance of our proposition.

A second important consideration in defining the problem is the fact that we are dealing with a new product. The average consumer has not had any experience with the system, and it is difficult for him to imagine just exactly what it is capable of. We certainly must avoid measuring consumers' "opinions on what is possible in the future" as this form of crystal ball-gazing invariable leads to disastrous results.

For this reason we employed a number of special techniques.

Research method. Two techniques were used in a three-phased approach: Group discussions and a telephone inquiry (866 usable inquiries).

The first phase consisted of group discussions, which allowed us to acquire an insight into the potential target groups as well as into the applications for which there is a real demand. This data was used in a television program broadcast on TV2.

The second phase consisted of telephone inquiry. At the end of May 1990, the program "Modem" was broadcast on TV2, which gave a clear presentation of the newest facilities in the field of cable television. The program was titled "What is the link between (almost) all Belgians?"

This cooperation allowed us to zoom in on the applications which we had identified as those most likely to succeed in the market. The viewers did not experience these facilities as futuristic but actually thought of them as a practicable project. Moreover, the viewers were informed at their homes via the television, the same medium through which the new services will be made available. These two elements largely determine the unique character of this search opportunity.

Five target groups were distinguished:

- the elderly (medical alarm service);
- suburban residents (burglary detection);
- sports lovers;
- viewers with a cultural interest (ticketing);
- families in the Maldegem-Eeklo region.

Via a direct mail campaign, these target groups were asked to watch the aforementioned TV program.

Of each target group some 200 persons were subsequently contacted for an interview.

Target groups which could not be reached via the mailing were approached in a different manner. For example: A video recording was made of the TV program, which was subsequently shown in a number of schools and cultural clubs to probe the opinions of school-age children (e.g. music selection application).

The broadcast also received extensive coverage in the weekly magazine "TV-Ekspress."

This magazine, too, was used in the market research (for further refinement of the target groups).

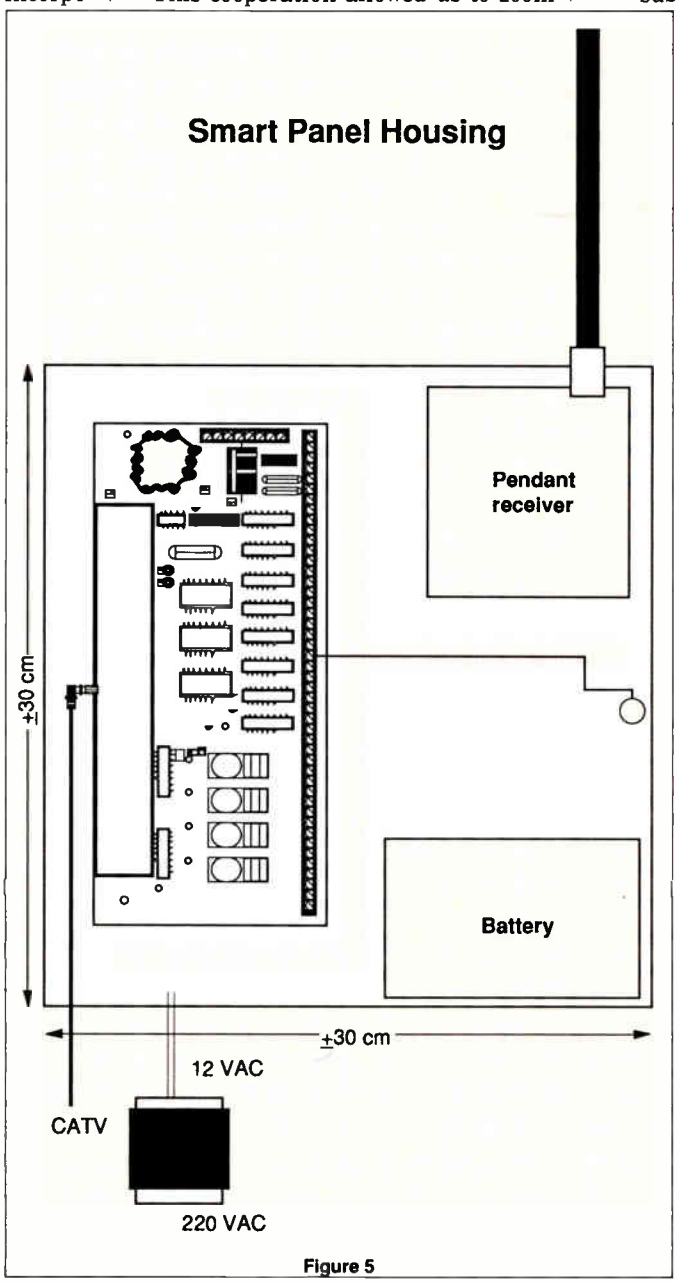


Figure 5

Results

Present offering of TV channels. The prime task of television is the dissemination of news. Since BRT-N (TV1) scores best in this field, this station is considered the primary (most indispensable) channel, although the majority of viewers watch VTM. There is, in fact, no direct link between the frequency with which a channel is watched and the importance (indispensability) of the channel.

Thematic channels (Eurosport, MTV) score better than most conventional stations (Germany 3, RAI, France 3, BBC), although the scores invariably remain low. In general, it can be said that Dutch-speaking cable subscribers primarily watch the six Dutch-speaking channels. The other stations

are only watched sporadically. Yet the vast majority do not want to see any of these stations disappear from the cable as the subscription fee is held to be a compensation for the total (acquired) offering.

The policy of the cable companies—continued growth of the number of channels without increase in the subscription fee—causes the subscriber to reason as follows: "Half of the channels may well disappear, provided that the subscription fee is lowered accordingly."

More than 70 percent of the interviewees said they do not actually need an additional channel (of the conventional type). Where additional stations are in demand, these are situated in the field of local TV or thematic channels. In this case, the demand is so strong that they are even willing to pay for it (pay TV). The "thematic channel" concept is a very broad one: for someone who is learning Spanish, Spanish TV can be viewed as a thematic channel.

A number of people (10 percent to 15 percent) also voiced their dissatisfaction with the current (international) levelling-down of TV programs, whilst the majority of viewers feel that there are not enough cultural and educational (e.g. nature) programs.

Alarm services. The telephone inquiry and the group discussion revealed that all target groups are particularly interested in being able to obtain a package of alarm services via the cable.

The medical alarm service scores very high: This service allows the elderly to stay longer in their homes (familiar environment), which enhances their quality of life.

There also exists a need for burglary and fire alarm services. This application is particularly appreciated by the self-employed (tax-deductible). The demand for burglary protection is equally great among all types of dwellings.

As for subscribers' willingness to pay an extra fee for these services, it was determined that medical alarm service could have a minimum of 15 percent penetration (at BEF 250/month). Burglary alarm service could enjoy a minimum of 10 percent penetration and fire alarm service would capture a minimum of 9 percent penetration.

Local television. As stated earlier, news is important. This is also true of the local news, which can only be brought by local TV stations. As a result, quite a number of people rate local television very highly and would like to see the number of channels extended accordingly. The majority are even willing to pay for this.

A problem here is that the term "local" cannot be readily defined and is actually dependent on the subject (local-regional). Local stations especially are required to strictly observe a rigid and horizontal (fixed) programming (e.g. one region on Mondays; another region on Tuesdays, etc.). The self-employed see local TV as a means of conducting local (and therefore payable) communication actions.

Pay TV. There is a marked interest for (first-run) movies, provided that the offering compares to that of videotheques and that each subscriber is free to watch the movie whenever he likes. This is of course impossible, and false expectations are created as a result. This is also the weak point of the present-day systems: one has no say in the actual programming, so that eventually a very high price has to be paid for each movie one has actually seen.

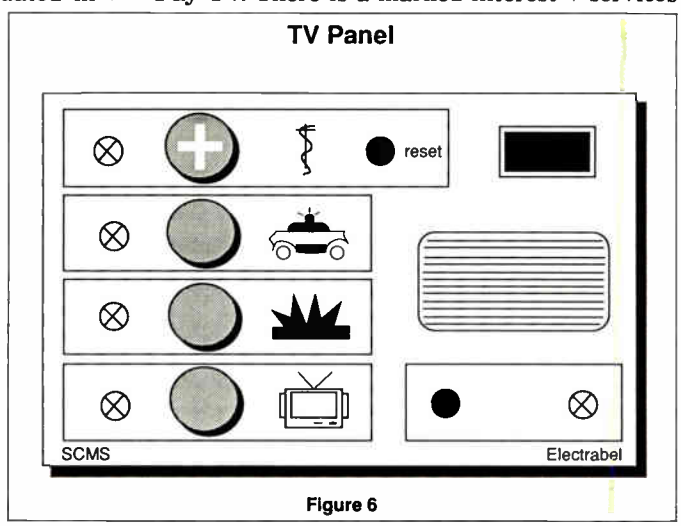


Figure 6

A system in which the subscriber only pays when he is actually watching the movie (pay-per-view) would obviously be more successful on the market. There will be a great demand for (soft) erotic movies. Family movies could do well on the weekend. The price fixing for pay-per-view depends on the day of broadcasting. On Friday nights the price could be twice the amount charged on Monday nights (family movies).

The in-depth market research clearly showed that the cable network, as a product, is ripe for diversification in a country where over 90 percent of the population can choose from more than 20 different programs. The following services in particular will be successful:

- alarm services: medical, burglary, fire (+10 percent). These alarm services will act as a Trojan horse for the other services.
- local TV (self-supporting or soft pay) (10 percent).

In addition, there is a demand for:

- pay-per-view (movies, sports)
- thematic programs (culture, nature, children).

The major condition for success is a consistent approach:

- From a technical point of view, it is essential that one single system be developed which is capable of individually decoding the various integrated services (also within one and the same household, requirements tend to vary in time). This is imperative both for financial reasons and in terms of user-friendliness, so that subscribers are prepared to purchase new services/equipment.
- In terms of marketing, a business plan must be drawn up which addresses the various issues from a financial, commercial, legal and organizational point of view.

It should further be emphasized that:

- Some of the applications as such do not yet warrant further investment in a two-way cable network (e.g. banking transactions, ticketing, shopping) because their chances of penetration are too small.

Nevertheless, the demand for these services may at one point increase dramatically (e.g. evolution of the use of cash dispensers; evolution of the use of telefax, an application which has been around for 20 years but has only been used intensively for the past few years). The integrated system should be technically prepared for this.

- The market research focused only on the needs of the average consumer. Professional groups with their requirements were not taken into consideration although they obviously may play an important role in determining the profitability of a two-way cable network (the consumption price level will be higher; tax-deductible). Example: information for lawyers, physicians, banking agents, etc.

Finally, it can be claimed that the medical alarm service (well-being alarm service) could offer a partial solution to an emerging socio-financial conflict: the care of the elderly. ■

Will cable ever make it in Japan?

CATV's been slow to catch on, but new efforts being made

To Westerners, the Japanese market can be a confusing environment because of huge cultural differences, tight government regulation, the language barrier and other factors.

In the video marketplace, the story is no different. There are widespread misconceptions about Japanese cable-TV, the direct broadcast satellite environment and even high definition television. For the uninitiated, Japan is indeed a confusing marketplace, but several U.S. cable companies are making significant progress in an industry still being born.

Tiny penetration rates

To date, only 2 million of Japan's 36 million households are passed by multichannel CATV systems. Of those, only 300,000 homes subscribe, leaving Japan's cable penetration at 15 percent. But if the number of subscribers is divided by the total number of households, CATV is available in less than 1 percent of homes.

However, those numbers will certainly grow. According to Doug Ross, vice president of new business development for Scientific-Atlanta's broadband communications group, 40 more franchises passing 3 million more homes have been awarded and are at some stage of development. "They're still very early in the (franchising) process," he notes. Others speculate that there are between 300 and 400 more franchises in the pipeline.

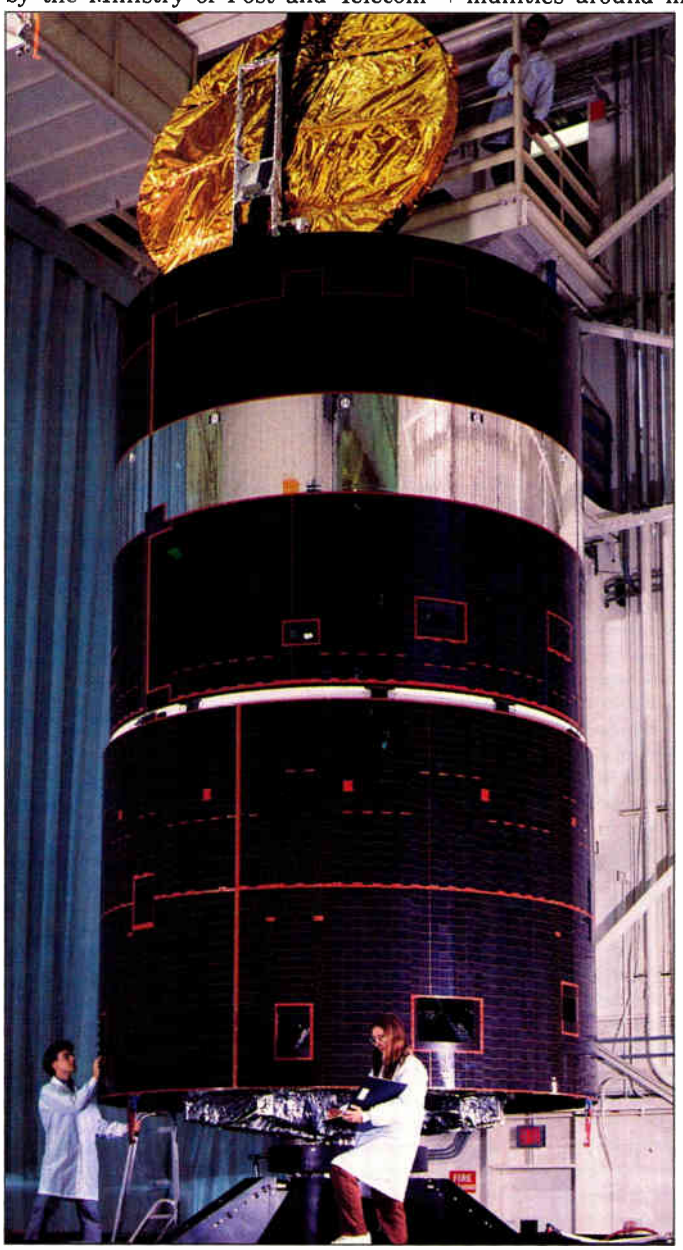
There are several issues holding back the development of CATV systems in Japan. Competition, lack of programming sources, operator inexperience, high up-front fees and government control are the biggest considerations.

In Japan's urban areas, there are numerous "compensation systems" that have already wired between 5 million and 6 million homes. These systems are similar to master antenna (SMATV) systems found in the U.S. Under Japanese law, any company that interferes with television signals (railroads, power companies, high-rise buildings, etc.) must offer an alternative method to receive those signals. According to Ross, these systems are most often operated by power companies, such as Tokyo Electric Power.

Franchising

While the franchising environment in Japan resembles that of the U.S. in the middle to late 1970s in terms of infancy, it certainly doesn't in speed of awards. All franchises must be awarded by the Ministry of Post and Telecommunications, which has wide and unlimited control over the industry.

The process has been politely termed as "methodical" by Americans who are used to a quicker pace. According to Ross, 50 is the maximum number of franchises that have been awarded in any one year. Most systems that are already in existence or being built now are located in suburban bedroom communities around major cities like Tokyo and Osaka, says Ross.



JCSat's DBS satellite was built by Hughes

Multiple system operators are impossible to find because the government has been careful not to allow monopolies. Most systems are owned by a consortium of Japanese investors, with no one entity owning a controlling portion. However, a few large companies (Sumitomo and C-Itoh) have numerous investments in both operations and programming sources.

When the systems are built, 450 MHz or 550 MHz hardware and electronics are used (but they're hardly loaded—more on that later). Additionally, they feature hybrid coax/fiber topologies similar to those used in the U.S. and are fully addressable and two-way active. Set-top converters that resemble consumer electronic devices control access to programming and offer a host of audio and video output ports.

While it appears

those systems are headed toward the same consumer electronics interface difficulties experienced in the U.S., there has been no effort to find a suitable solution. That's probably because cable penetration rates are so low, experts say. But Ross predicts it will become an issue in the future.

Competition

But right now, DBS and programming are the hurdles CATV faces in it's race toward profitability.

Contrary to general impressions, Japan's satellite industry has been plagued with problems, stemming mostly from technical problems related to the launching of the birds. In just the recent past, three satellites were destroyed during launches, another lost altitude after gaining orbit and yet another ran out of fuel when a valve was left open.

However, numerous other satellites are scheduled to fill the skies above Japan by mid-decade, said Kris Kelkar, director of international business development for General Instrument's VideoCipher division. Right now, in spite of its problems, Kelkar says satellite dishes deliver programming to more than 2 million people. (Others estimate that more than 4 million satellite dishes have been distributed throughout Japan.)

The satellite industry in Japan consists of high-power, government subsidized broadcast satellites (BS), designed for direct-to-home broadcasting, and medium-power, more entrepreneurial commercial satellites (CS), which are designed to deliver programming to cable systems headends. Additionally, CS satellites pass through telephony, data and specialty video traffic.

Presently, BS offers three programming services. Two of those are run by NHK, the government-owned broadcaster. One of those is a duplication of the NHK terrestrial signal. The third one is brand new. It's called the "Wow Wow Channel," it's a premium service, much like Home Box Office, and it's been signing up subscribers at a frenetic pace.

CS has two satellites, owned and operated by Japan Communication Satellite (JCSat) and SCC. A maximum of three programmers will eventually be licensed on each of the CS birds. The application process is currently open, but a decision on those licenses is due by year's end, says Kelkar. And despite all the press coverage surrounding Japan and HDTV, it still isn't offered full-time or in a large number of locations. These facts, coupled with a terrestrial broadcasting industry that offers no more than seven television stations, leave the typical Japanese viewer "starved for programming," Kelkar concludes.

That situation could change in the next few years because companies are literally waiting in line to launch new satellites, which will provide plenty of new transponder space.

Everyone's keeping a close eye on compression systems, which could easily quadruple the number of channels available. "No one knows how the market will evolve," says Kelkar. "Channel (capacity) could increase dramatically by 1995 or 1996."

> The Japanese franchising process has been politely termed as 'methodical' by Americans who are used to a quicker pace.

Operations

Another hindrance to increased CATV penetration has been inexperience and a bewildering pricing structure. It is common for subscribers to pay $300 for a cable installation, $200 to $300 as a one-time "membership" or "initiation" fee and yet more money as a TV tuning fee. Those fees, coupled with the flat-rate basic fee of about $20 a month for basic programming, often resulted in viewers opting to pay for DBS instead.

However, there is an attempt to bring American practices to cable system operations in Japan—with an eye toward improving penetration rates and costs of doing business.

Viacom Worldwide, the marketing and consulting arm of Viacom International, which owns cable systems and programming services in the U.S., has partnered with Sumitomo in its system in Urawa, located outside Tokyo. The system passes 78,000 homes and was launched August 1 with the highest penetration rate any system has ever enjoyed on day one. Dave Archer, VP of international business development at Viacom, believes that was made possible by streamlining costs and fee structures. While Archer didn't elaborate on what that penetration rate was, he did say that he is hoping for a 10 percent to 15 percent take rate on the first pass. "Then we'll go from there," he added.

Archer said early market research showed that the typical Japanese viewer didn't really know what cable-TV was. "Many thought it was CNN," said Archer. Consequently, marketing CATV as a concept has become a high priority. Furthermore, VCR penetration is high and viewers typically watch only two to three hours of TV per day, vs. the seven hours Americans spend in front of the tube every day.

High-rise MDUs

But the real key to unlocking the Japanese market may be in entry to high-rise MDUs, which cloud many big-city skylines. However, access to those buildings require approval and meetings are usually held just once a year.

Another option is to get involved with the compensation systems, says Archer. He sees these systems as prime targets for takeover (an operator is obligated to manage a compensation system for 10 years after it is built; after that, it could be sold). The idea here is to upgrade residents from SMATV services to CATV offerings.

On the technical front, Archer notes that because of the scarcity of programming, a bandwidth crunch hasn't been felt yet. Consequently, there is little perceived need for compression technology. Conversely, however, there is high interest in fiber optic technology, perhaps because of its immunity to ingress and leakage. It certainly isn't primarily related to picture quality, because the average length of an amplifier cascade in Japan is just nine devices.

Despite its slow rate of progression in Japan, cable-television is predicted by many to be a force to one day be reckoned with. Judging from the appetite shown by the Japanese for anything video related, it's hard to argue with that forecast. ■

—Roger Brown

INTERNATIONAL CALLBOOK

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Scientific Atlanta

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Australia
PERSONNEL: Steve Dean, general manager
DESCRIPTION: Total system supplier for CATV and pay-TV systems worldwide. Product range includes complete headend range, antennas, earth stations, trunk and line amplifiers (from basic push-pull to advanced feed-foward technology), AM fiber optic transmission equipment, subscriber addressable and non-addressable converters, systems and CD standard digital audio transmission equipment.

Netherlands

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PO Box 10.265
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Shin Yurigaoka Fine Building, 3-E
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PERSONNEL: Bob Matsumoto, managing director
DESCRIPTION: Total system supplier for CATV and pay-TV systems worldwide. Product range includes complete headend range, antennas, earth stations, trunk and line amplifiers (from basic push-pull to advanced feed-foward technology), AM fiber optic transmission equipment, subscriber addressable and non-addressable converters, systems and CD standard digital audio transmission equipment.

Singapore

JERROLD COMMUNICATIONS

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FAX . . . . . .(65) 235-6723
16 Lady Hill Rd.
Singapore 1025
PERSONNEL: Kurtis Whitt, account manager, Pacific Rim
DESCRIPTION: Manufacturer of full line of cable television equipment, including COMMANDER® and S-Series satellite receivers and modulators; Cableoptics® fiber optoelectronics, including STARBURST system architecture; STARLINE® amplifiers, line extenders and taps; IMPULSE 7000 and TOCOM impulse-capable addressable converters; STARCOM® plain converters; and computerized addressable headend equipment, including signal scramblers.

Taiwan

Scientific Atlanta

Quatek Company, Ltd. . . . .(02) 5017065
FAX . . . . . .(02) 5095329
Room 1104, No. 147, Section 2
Chien Kuo North Road
Taipei, Taiwan 10479 R.O.C.
PERSONNEL: Hao-Pou Hsu, project manager
DESCRIPTION: Total system supplier for CATV and pay-TV systems worldwide. Product range includes complete headend range, antennas, earth stations, trunk and line amplifiers (from basic push-pull to advanced feed-foward technology), AM fiber optic transmission equipment, subscriber addressable and non-addressable converters, systems and CD standard digital audio transmission equipment.

Cypress

ALPHA TECHNOLOGIES

Alphatec Ltd. 357-5-375675
FAX 357-5-359595
PO Box 6468
Limassol, Cyprus
PERSONNEL:Ms. M. Constantinou
DESCRIPTION: Alpha Technologies designs, manufactures and markets standby power systems, uninterruptible power sources, status monitoring systems, software and modems, batteries, and CATV surge protection products for CATV systems domestically and internationally. Alpha is the world's largest manufacturer of 60 VAC products for CATV and broadband applications, producing AC power products in both 50 and 60 Hz versions in Canada and the USA. The company also owns and operates Argus Technologies, a specialized manufacturer of 48 VDC rectifier equipment for telephone central office power plant, and Flight Trac, Inc., providing airborne signal metering services.

Brazil

JERROLD COMMUNICATIONS

Jerrold Comms. . . .011-55-11-709-1443
FAX 011-55-11-421-6439
Station Square Alphaville
Alameda Madeira, 53-9 ANDAR
Conjunto 1, CEP 06454-Alphaville-Barueri
Sao Paulo, Brazil
PERSONNEL: Theodore R. Taylor, Jr. Account Manager, South America
DESCRIPTION: Manufacturer of full line of cable television equipment, including COMMANDER® and S-Series satellite receivers and modulators; Cableoptics® fiber optoelectronics, including STARBURST system architecture; STARLINE® amplifiers, line extenders and taps; IMPULSE 7000 and TOCOM impulse-capable addressable converters; STARCOM® plain converters; and computerized addressable headend equipment, including signal scramblers.

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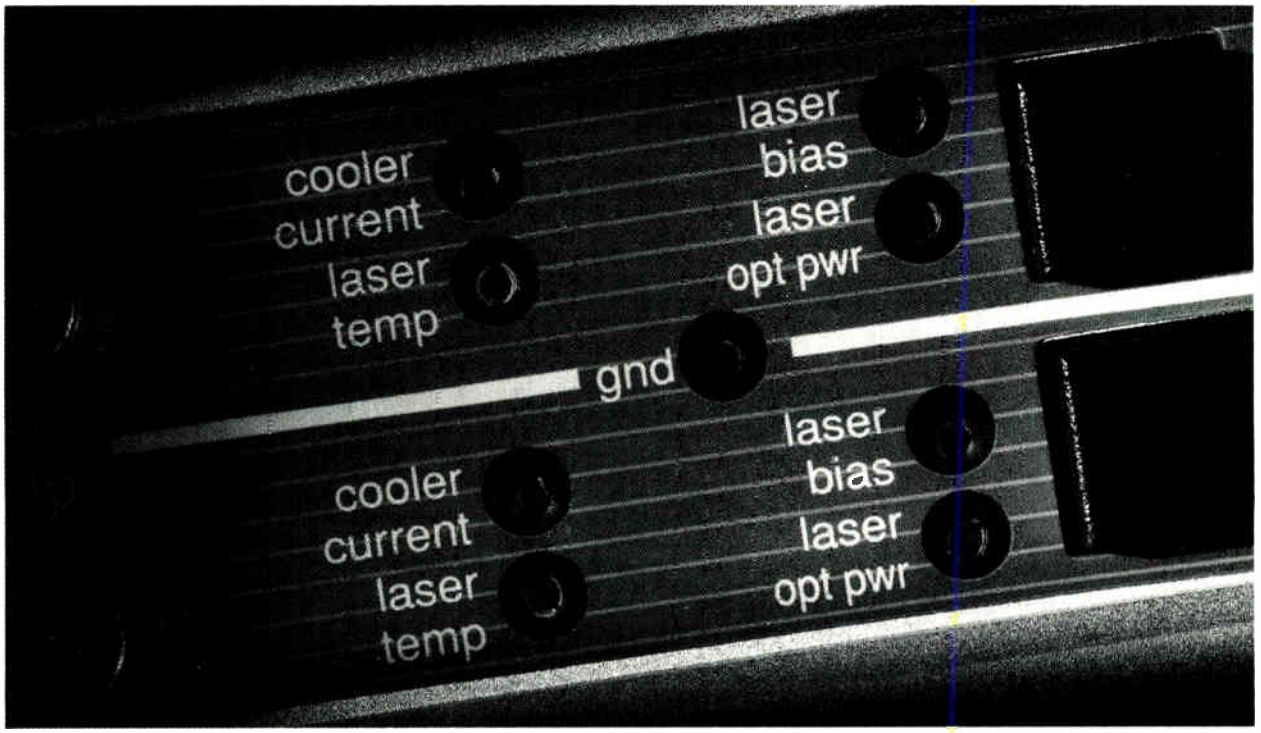

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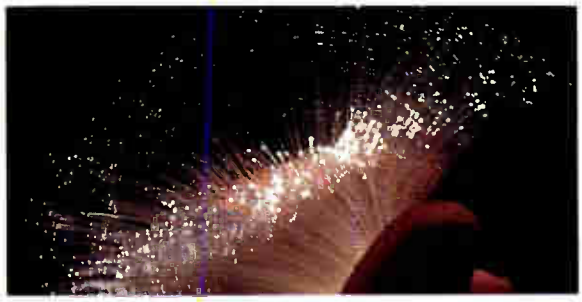

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AT&T Technology Integrator

Fine-Tuning the World of Fiber Optics

Circle Reader Service No. 20

Continued from page 34

We faced another challenge with this installation. We had the opportunity to sell our high-powered microwave equipment to another cable operator in one of the mountain states where, because of geography, fiber is not feasible. We had a small window of opportunity—30 days—during which we had to purchase the fiber and related equipment and build it—install a total of 27 strand miles—and switch it over.

Part of the installation was underground. Photo courtesy ONI

In fact, the day the new owner came to pick up the equipment, both systems were operating in tandem; two of the three hubs had been cutover, but we were still splicing and troubleshooting the final one. Picture this: We were at the last hub, while the new owners of the transmit facility, armed with screwdrivers, were getting ready to disassemble it and take it off of the air. Fortunately, I was able to entice the crew with lunch, so that we could finish up on our end so our subscribers wouldn't be without service.

Community responsibility

The longest, most intensive part of the tightly compressed schedule was the first two weeks of the project—the make-ready work of trimming trees, putting rollers and rope in the air, moving drop lines that serve houses, pulling them down so that we would be able to pull through without destroying anything, and otherwise meeting California's state code which specifies restorative measures concerning work done on telephone poles.

The tree-trimming alone was a monumental task. We always want to be as good a neighbor as possible, and want all of our subscribers to continue to enjoy doing business with us. Carelessly trimmed or damaged trees, or uncollected debris are not the calling cards we leave behind.

Although 27 strand-miles is not an extraordinarily long distance in a new-build, with everything involved in make-ready, we actually made the 27-mile pass a total of four times—with the final pass lashing the fiber to the strand.

The actual construction work and splicing was done in-house. To meet the deadline, our crews worked six-day weeks; 16-hour days were not unusual, depending on particular locations.

In addition to the relatively "routine" aspects of this tightly compressed installation, Continental was also conducting a beta test for AT&T. This was being done on a new LXE armor-free cable.

For the first eight to 10 miles of the installation, we used the LXE armored cable; then we used the new cable. In pulling that fiber, we found that the fiber—itself lighter than the rope that we had in the air—pulled really well. During the installation, one of our crews accidentally ran over that fiber with a two-ton aerial truck. Because there is no armor on the jacket, we expected the worst; when we shot a signal through it, we were pleasantly supprised—it was undamaged.

In the course of installing the cable, we had two 17,000-foot pulls, totalling 3.5 miles of fiber. The pulls were accomplished in two days—only four days before the end of the project.

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Circle Reader Service No. 22

Organizing for outages

Part IV

Editor's note: *In this final part of the series on outage control, the authors discuss zeners, spark gaps and crowbar protective devices and include details and overall results of the survival tests recently done on them.*

Zeners

A zener is a Silicon Avalanche Semiconductor Device (SASD). At a certain controlled point in the terminal voltage vs. current line, it has a very sharp, well defined "knee" where it starts to draw current, in an effort to keep the voltage across the terminals from rising. Given sufficient resistance/impedance to work against, the zener will draw as much current from the source as is necessary to maintain a constant voltage equal to the manufacturer's specification.

In an overvoltage situation, as shown in Figure 1, the sine wave has a peak value considerably higher than the zener conduction voltage where it starts to draw current to hold the terminal voltage constant. When the applied voltage drops below the zener voltage, the zener is virtually out of circuit. The zener's attack time is very fast—in the order of a few nanoseconds.

Two problems become obvious when looking at the waveforms. First, the zener has merely clipped the overvoltage, and there is a large amount of energy left. Secondly, the large voltage that the zener is maintaining across its terminals, in conjunction with the large current that must be drawn to hold down that voltage coming from a low impedance source, means that the zener has to dissipate a large amount of power (the same applies to transients). This is of course equal to I^2R and is substantial.

In effect this means that the zener has to be unconscionably big or the protection it can afford in moderate sizes is inadequate for outside plant. Also, when considering a step function and propagation times, it turns out that shorting to ground, rather than clipping, gives greater protection over a wider area.

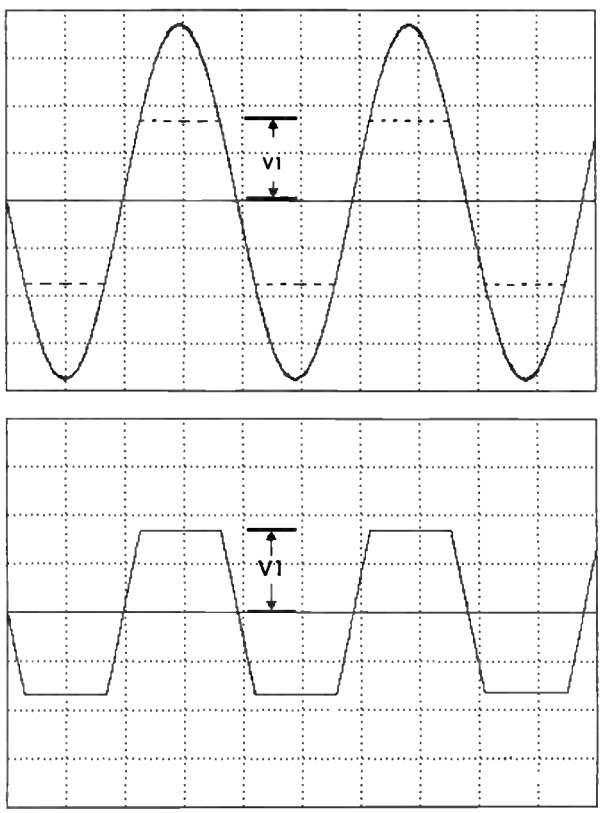

ILLUSTRATION OF I^2R LOSSES IN ZENER TYPE CLAMPING CIRCUIT

Figure 1

Spark gaps

The industry now has available a new breed of heavy duty radioactive spark gaps, designated H/D. We all remember the older version which would fail shorted, necessitating location and disinterring of the pellet, or they would fail open, leaving us in a fool's paradise without protection.

The graph of the H/D in Figure 2 is particularly impressive, indicating that the unit will short to ground currents in the thousands of amps for up to 10 microseconds. If the transient/overvoltage lasts longer than that, a derating curve has to be followed.

STANDARD AND HD GAS TUBE SURGE ARRESTORS

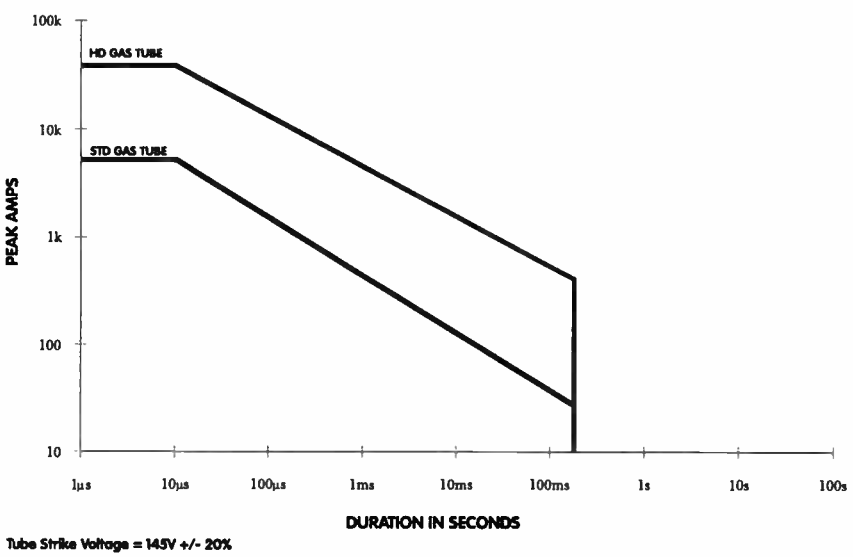

Figure 2

By Tom Osterman, Director of Research & Development, Alpha Technologies and Roy Ehman, Director of Engineering, Jones Intercable

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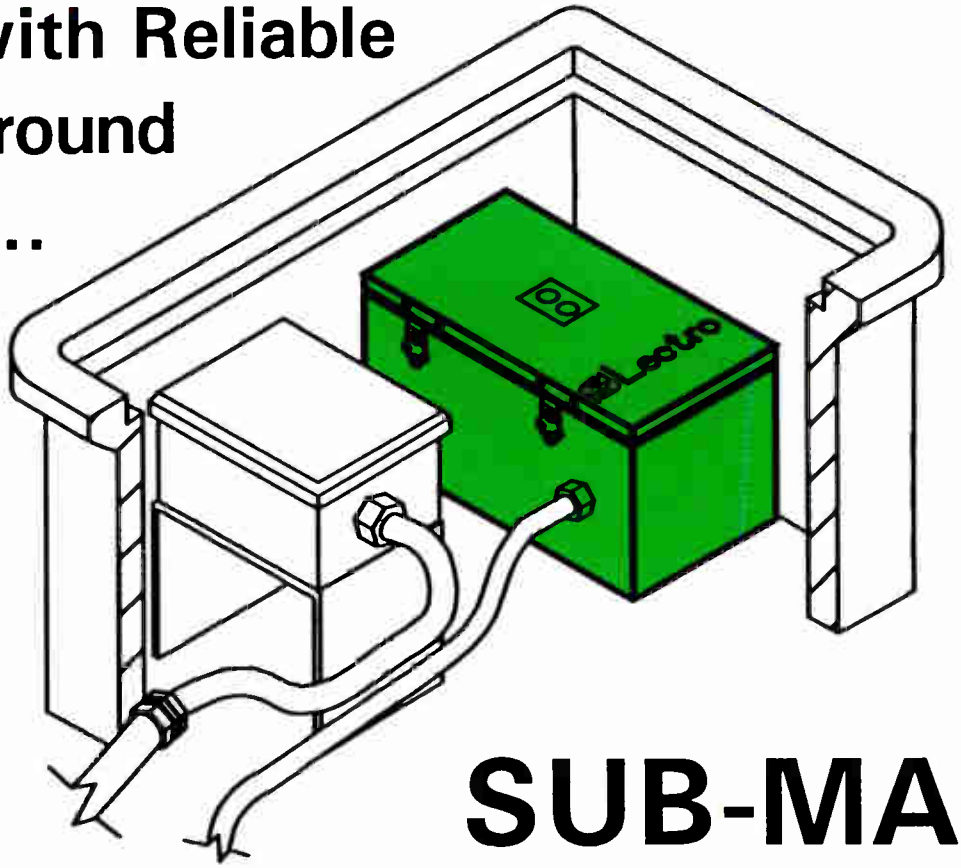

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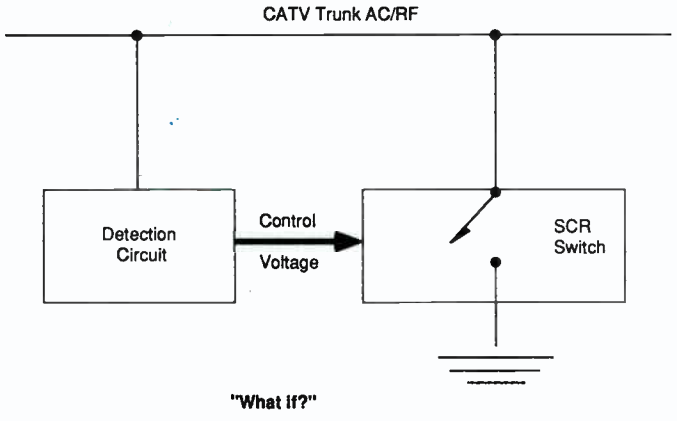
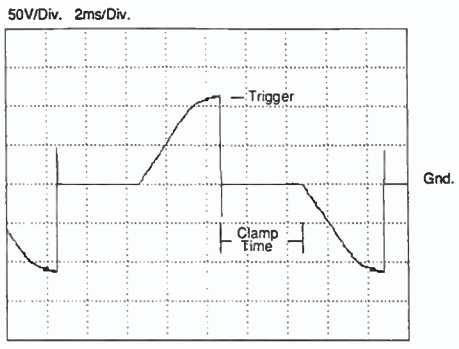


Figure 3



Regulating Action

Figure 4

It is doubtful whether currents of that magnitude could ever be found on a cable coax center conductor, but we do need to concern ourselves with longer durations. The reason for looking at times in the milliseconds range rather than the microseconds, is that once the protective device has dealt with the leading edge of a fast transient, it is in a conducting state and must now handle the follow-on short circuit current of about 23 amps from the power supply, until the voltage drops to around 90 volts when the gas tube extinguishes.

This is an effect similar to what the zener does. If the transient is repetitive and fires the tube for several half cycles (8 to 48 or more milliseconds), it will have to deal with the follow-on current during this time. It is currently believed that each successive half cycle tears more molecules out of the electrodes, heating the tube and making a minute deposit on the glass envelope. This eventually provides an additional, conductive path, ultimately causing the self-destruction of the device.

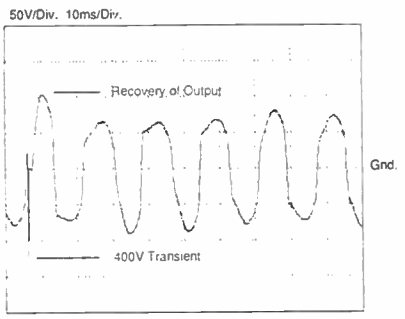
Crowbar devices

In 1985, engineers from a 2,500-mile system in Virginia complained that every summer it was being hit by electrical storms which left a path of burned out actives in the plant where the storm had passed through. Additionally, the county power system would go high or sag (see Fig. 3). (*It was in response to this situation that the crowbar device was developed by the authors of this article.—Ed.*)

Three handmade prototypes using power inserters as the host were made and installed: One in a pedestal, one overhead, and one kept in reserve.

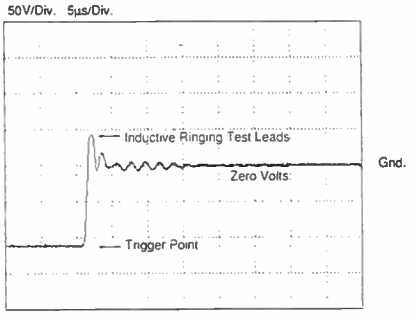
The results were dramatic. For the remaining storms, the protected plant was unscathed while the rest suffered severe electrical damage. Subsequent widespread use of the final product throughout the CATV industry and housed in a number of different host passives has amply verified and duplicated the results. Indeed, many operators have claimed reductions of 50 percent to 80 percent in lightning and other transient related outages.

This is how they work: When the voltage across the crowbar exceeds the trigger voltage of 104 volts, the SCR which is appropriate for the pulse polarity fires, grabs the pulse and takes it to within 0.3 volts of sheath/ground in much less than a microsecond. Because of the low voltage drop across the devices, they can handle 500 amperes for 16 milliseconds and 35 amperes indefinitely, the latter current being far more than the maximum



400V Spike Caught at 104 Volts and Grounded Out in Ø.5 „Sec

Figure 5



Step Function From 220V to Ø in Ø.5 „Sec

Figure 6

follow-on current from a ferroresonant power supply.

Figure 4 shows the regulating action of the crowbar under continuous sine wave over voltage. Figure 5 shows what was an applied 400 volt pulse, but it was "grabbed" by the crowbar at ±104 volts and taken all the way to within 0.3 volts of zero potential in less than 0.5 µsec.

Finally, in Figure 6 we use an expanded time scale of 5 µsec/division (one dot = 0.5 µsec) to show a 220 volt step function taken to zero in 0.5 µsec (one dot).

CableLabs role and tests

Due in part to the widespread industry focus on improving system reliability, CableLabs has recently sponsored an Outage Reduction Task Force. The task force is divided into several working groups which are responsible for research and recommendations for "hands on" techniques to reduce outages.

The outside plant protection working groups were given the responsibility to review the methodology of grounding and bonding, organizational approaches, as well as to establish a test procedure that can be used for the comparison of the electronic devices currently used in the industry for plant protection.

A preliminary release of the test results is included in this article. Further test data, research results and

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to the load were excessive. The test constants and associated test results were:

Transient voltage 6 KV—Clamping voltage 189 to 213V

Transient current 3 KA—Let-through current 1513 to 1545A.

The axial lead gas tubes were also subjected to Test 1; they survived all of the test impulses without any noticeable degradation. Test constants and associated results were (see Figure 9):

Transient voltage 6 KV—Clamping voltage 93 to 112V

Transient current 3 KA—Let-through current 62 to 69A.

The HD (button type) gas tubes were subjected to Test 1; they survived the test without any noticeable degradation and performed better than the axial leaded version. Test constants and associated results were (See Fig. 10):

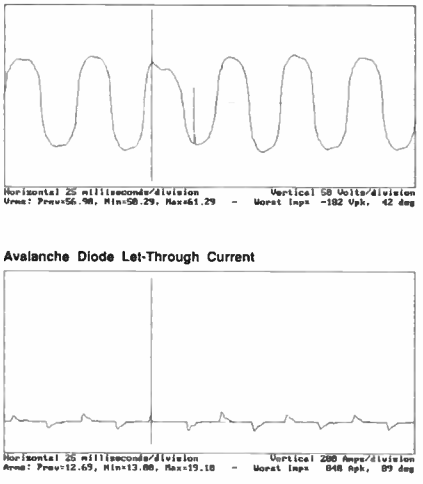

Figure 11

Transient voltage 6 KV—Clamping voltage 80 to 105V

Transient current 3 KA—Let-through current: none measurable.

The series-string silicon avalanche diode device was subjected to Test 1; each device survived the initial impulse, but after approximately one minute the device failed short circuit. The devices passed through a relatively high amount of surge current and an excessive voltage level prior to failure.

This test was repeated three times with different samples which consistently failed 30 to 60 seconds after impulse. Test constants and associated results were:

Transient voltage 6 KV—Clamping voltage 170 to 215V

Transient current 3 KA—Let-through current 760 to 840A.

The silicon avalanche diode with bridge rectifier input was subjected to Test 1; the lone sample failed short circuit with the first impulse and passed through an unacceptably high level of voltage and current. Test constants and associated results were (See Fig. 11):

Transient voltage 6 KV—Clamping voltage 144V

Transient current 3 KA—Let-through current 1064A.

The Hybrid (MOV + additional components) was subjected to Test 1; the device survived repeated impulses with performance very similar to the MOV's with a high let-through current and voltage. Test constants and associated results were (see Fig. 12):

Transient voltage 6 KV—Clamping voltage 189 to 219V

Transient current 3 KA—Let-through current 1435 to 1486A.

The triac-based crowbar device was subjected to Test 1 and 2. In Test 1, the device was installed in three different manufacturers' power inserter housings, with 60 VAC applied at the power

degradation and resultant maintenance liability as MOVs.

The avalanche diode protectors are a fast-responding device, but are limited in their energy dissipation capability. The devices sold for cable applications are typically potted in epoxy, increasing the difficulty in getting the heat out of the silicon junction. These devices can function well in current limited DC or AC circuits such as circuit board protectors, etc. The devices tested did not have the capability to survive Test 1 energy levels, which may be low in comparison to the typical cable plant.

The triac based crowbar device passed the Test 2 thermal stress test, but failed the Test 1 transient test. The clamp voltage and let-through current were good, indicating that the crowbar was functional during the transient event but suffered junction failure as a result of the transient energy. The SCR based crowbar passed both Test 1 and 2 with good performance in clamping voltage and let-through current. Both crowbar devices had clamp voltages equivalent to the gas discharge tubes.

There are several devices used for transient protection of CATV plant. The ANSI/IEEE C62.41-1980 and U.L. 497A test standards have been reviewed and tested for the purpose of providing system operators and vendors a real world means of device comparison. Transient protection devices were tested to determine their survivability and performance when exposed to harmful transients in a simulated cable plant environment.

The primary objective is to determine the devices and methodology to be used to obtain the highest possible plant reliability, minimize outages, and thus to maintain satisfied customers. ■

Editor's Note: *The tests described above are only* proposed *as standard test methodologies for surge suppression devices. CableLabs' Outage Reduction Task Force will likely issue recommendations in the near future. In the interim, individual operators or systems are encouraged to perform their own tests of these devices. None of the manufacturers of devices tested by CableLabs have been given complete test results as yet and some may dispute the findings of the tests. Furthermore, the opinions expressed in this article are solely those of the authors. Persons with opposing points of view are encouraged to respond in writing to this magazine.*

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Transient voltage 6 KV—Clamping voltage 80 to 105V

Transient current 3 KA—Let-through current: none measurable.

The series-string silicon avalanche diode device was subjected to Test 1; each device survived the initial impulse, but after approximately one minute the device failed short circuit.

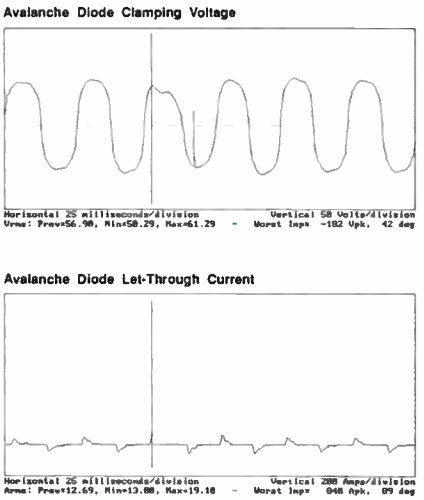

Figure 11

The devices passed through a relatively high amount of surge current and an excessive voltage level prior to failure.

This test was repeated three times with different samples which consistently failed 30 to 60 seconds after impulse. Test constants and associated results were:

Transient voltage 6 KV—Clamping voltage 170 to 215V

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The silicon avalanche diode with bridge rectifier input was subjected to Test 1; the lone sample failed short circuit with the first impulse and passed through an unacceptably high level of voltage and current. Test constants and associated results were (See Fig. 11):

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The Hybrid (MOV + additional components) was subjected to Test 1; the device survived repeated impulses with performance very similar to the MOV's with a high let-through current and voltage. Test constants and associated results were (see Fig. 12):

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The triac-based crowbar device was subjected to Test 1 and 2. In Test 1, the device was installed in three different manufacturers' power inserter housings, with 60 VAC applied at the power

insertion port. The transients were injected via the RF through-port. The devices failed short circuit after each single impulse was applied. Test constants and associated results were (see Fig. 13):

Transient voltage 6 KV—Clamping voltage 92 to 124V

Transient Current 3 KA—Let-through current 0 to 133A.

The triac-based crowbar device was subjected to Test 2 with no failure or noticeable degradation in performance.

The SCR-based crowbar device was subjected to Test 1 and 2. The device was installed in two different manufacturers' power inserter housings, with 60 VAC applied at the power insertion port. The transients were injected via the RF through-port. The devices survived all test impulses with no noticeable degradation or loss of protective function. Test constants and associated results were:

Transient voltage 6 KV—Clamping voltage 98 to 139V

Transient current 3 KA—Let-through current 0 to 69A.

The SCR based crowbar device was subjected to Test 2 with no failure or noticeable degradation in performance.

Summary

The results of Test 1 provide a comparison of survivability and performance of each of the transient devices that was evaluated. The ANSI/IEEE standard C62.41-1980 is used extensively in computer and consumer electronics manufacturing to determine the survivability of equipment subjected to electrical transients.

The voltage and current levels specified in this test are representative of what can be encountered in a residential or industrial feeder or branch circuit. The voltage in this environment is usually limited to the "arc-over" voltage or dielectric strength of the conductors typically used. The current specification is derived from the typical resistance/impedance of the service entrance and distribution wiring.

It can be argued that this test does not accurately simulate the electrical characteristic of the typical cable system. The electrical network of the cable system could see transient characteristics significantly higher in voltage and current as well as frequency of occurrence.

This, of course, is because of the cable conductive and inductive proximity to high voltage utility conductors and due to the low impedance to ground in numerous locations.

This test was used in spite of its limited transferability to the cable environment because it is recognized worldwide, it is repeatable, and there are several manufacturers of test equipment for the test. It served well as a tool for comparison of transient protection device characteristics.

The modified UL 497A Test was intended to simulate the thermal stress that a crowbar device would experience if triggered into the conductive state for a prolonged period of time. Crowbar devices are triggered into conduction by any transient event that exceeds the threshold of the trigger circuitry. This is typically between 90 and 130 volts peak.

(For reference, 60 volts RMS is approximately 70 to 75 volts peak for ferroresonant transformer based power supplies.) In a worst case situation,

crowbars latch on for the full half cycle of the 60 VAC, 60 Hz output of the power supply. During this time the crowbar is conducting the short circuit foldback current of the power supply, which can be as much as 30 amps.

The power dissipated by the crowbar during this time can be as much as 40 watts, causing thermal stress of the semiconductors.

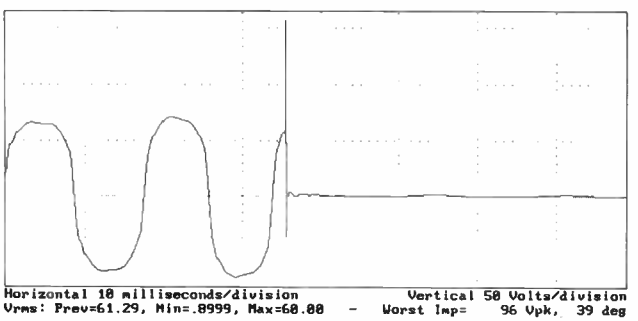
The test duration was somewhat arbitrary because it is hard to define the realistic duration of sheath currents high enough to generate the voltage necessary for prolonged conduction of a crowbar device.

MOV performance poor

The performance of MOVs was poor. Although they survived the tests, the let-through and clamping voltage current were high, and their progressive failure characteristics make them a maintenance liability and a contributor to lower plant reliability. The gas discharge tubes performed well in the transient test. They were not subjected to the number of events necessary to cause a buildup of a conductive carbon "arc-track."

The failure mode of gas tubes is short circuit. In the manufacturer's literature there is a warning not to exceed the AC follow-on current specifications. The follow-on current (after transient) is provided by the 60 volt supply or by sheath currents. The typical specification is 100 to 400 amps making it somewhat unlikely that the

Triac-based Crowbar Clamping Voltage



Triac-based Crowbar Let-Through Current

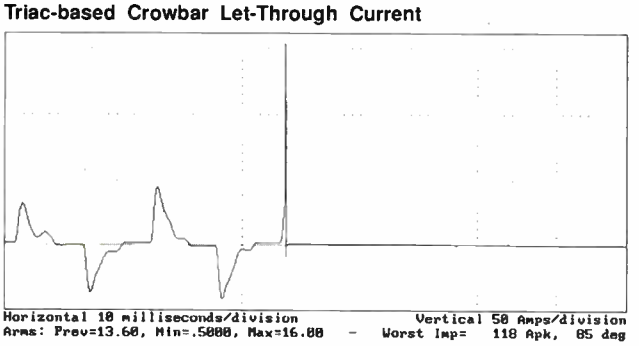
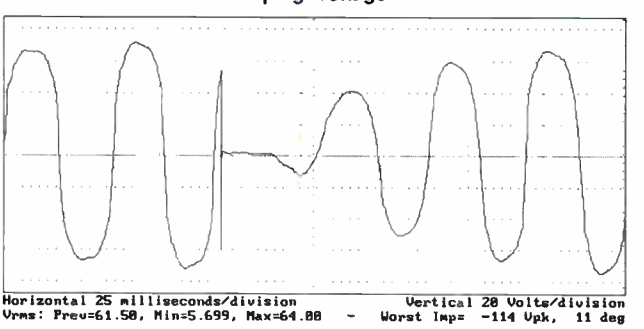


Figure 12

SCR-based Crowbar Clamping Voltage



SCR-based Crowbar Let-Through Current

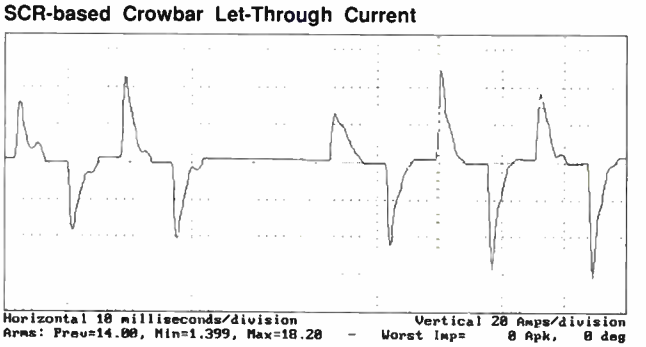


Figure 13

degradation and resultant maintenance liability as MOVs.

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There are several devices used for transient protection of CATV plant. The ANSI/IEEE C62.41-1980 and U.L. 497A test standards have been reviewed and tested for the purpose of providing system operators and vendors a real world means of device comparison. Transient protection devices were tested to determine their survivability and performance when exposed to harmful transients in a simulated cable plant environment.

The primary objective is to determine the devices and methodology to be used to obtain the highest possible plant reliability, minimize outages, and thus to maintain satisfied customers. ■

Editor's Note: *The tests described above are only* proposed *as standard test methodologies for surge suppression devices. CableLabs' Outage Reduction Task Force will likely issue recommendations in the near future. In the interim, individual operators or systems are encouraged to perform their own tests of these devices. None of the manufacturers of devices tested by CableLabs have been given complete test results as yet and some may dispute the findings of the tests. Furthermore, the opinions expressed in this article are solely those of the authors. Persons with opposing points of view are encouraged to respond in writing to this magazine.*

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Circle Reader Service No. 27

A new composite headend cable for video and audio

CATV systems continuously search for new or improved technologies to enhance system performance. The headend cable, an integral part of system performance, carries transmissions of audio and video signals from antennas to electronic equipment. Two cables are required in systems today: A coax and a twisted pair.

The complexity of today's multichannel systems require large numbers of both coax and twisted pair cables to support the system demand. Carrying inventory on both products adds expense, requires additional space and could result in delayed installation because of a lack of inventory of one of the cable types.

Also, traceability of the audio cable is difficult simply because of the large number of audio cables. However, a new siamese designed product, with both coaxial and twisted pair contained in one cable, serves to alleviate problems associated with previous two-cable type designs.

Physical Dimensions (Nominal)

Component	Inches	mm
Center Conductor Diameter	0.032	0.810
Diameter Over Dielectric	0.144	3.660
Diameter Over First Shield	0.152	3.860
Diameter Over Jacket	0.265	6.730
Audio Pair Diameter (22 AWG)	0.030	0.760
Drain Wire Diameter (24 AWG)	0.024	0.610
Jacket Diameter Over 3 Pair	0.265	6.730
Bundle Width	0.560	14.22

Audio Pair

Shield Construction -	One Pair + Mylar Drain Wire + Aluminum Foil
Pair Color	Red/Green, Red/Black, Red/White

Electrical Characteristics (Nominal)

Impedance	75 ohms
Capacitance	16.2 pf/ft (53 nf/km)
Velocity of Propagation	82%
3 Pair (DCR)	15.7 ohms/1000 ft (51.51 ohms/km)

Table 1

Cable description

The new cable design consists of a coax and twisted pair contained in a siamese cable. The coax is a 22 AWG silver coated copper steel center conductor with foam polyethylene dielectric. The shielding consists of a laminated aluminum foil tape and two braided shields of 95 percent coverage. The coax product is jacketed with a UL "V" tray rated polyvinyl chloride material. The twisted pair product consists of three pair, 22 AWG bunched with a 24 AWG drain wire. The pairs are individually shielded. The bunched pairs are jacketed with a UL "V" tray rated polyvinyl chloride.

Application improvements

There are several application advantages using the dual headend design as opposed to two cable designed systems.

1. Dual headend is a total package, thus "one cable" installed.
2. Installations are easier and faster because of pulling and handling one cable instead of two.
3. Replacing or tracing cables becomes easier since the siamese package lays flat. The flatness, in turn, tends to reduce the tendency to twist around other cables.
4. The appearance of the headend wiring network becomes neater.
5. Three audio pairs are usually adequate for most designs, typically left and right stereo, plus the third pair for mono or second audio programming. Since each of the three pairs is individually shielded, the possibility of crosstalk is reduced.
6. This construction also provides a separate drain wire in each group that serves as a ground in balanced audio applications. ■

By Terry McAlister and Mike Drum, Comm/Scope Inc., and Steve Willardson, Tele-Communications Inc.

Dual video/audio headend Cable

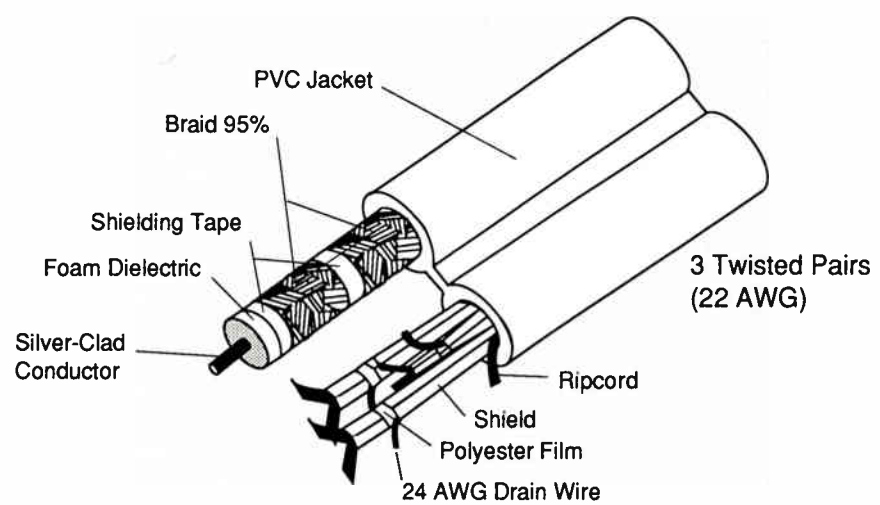
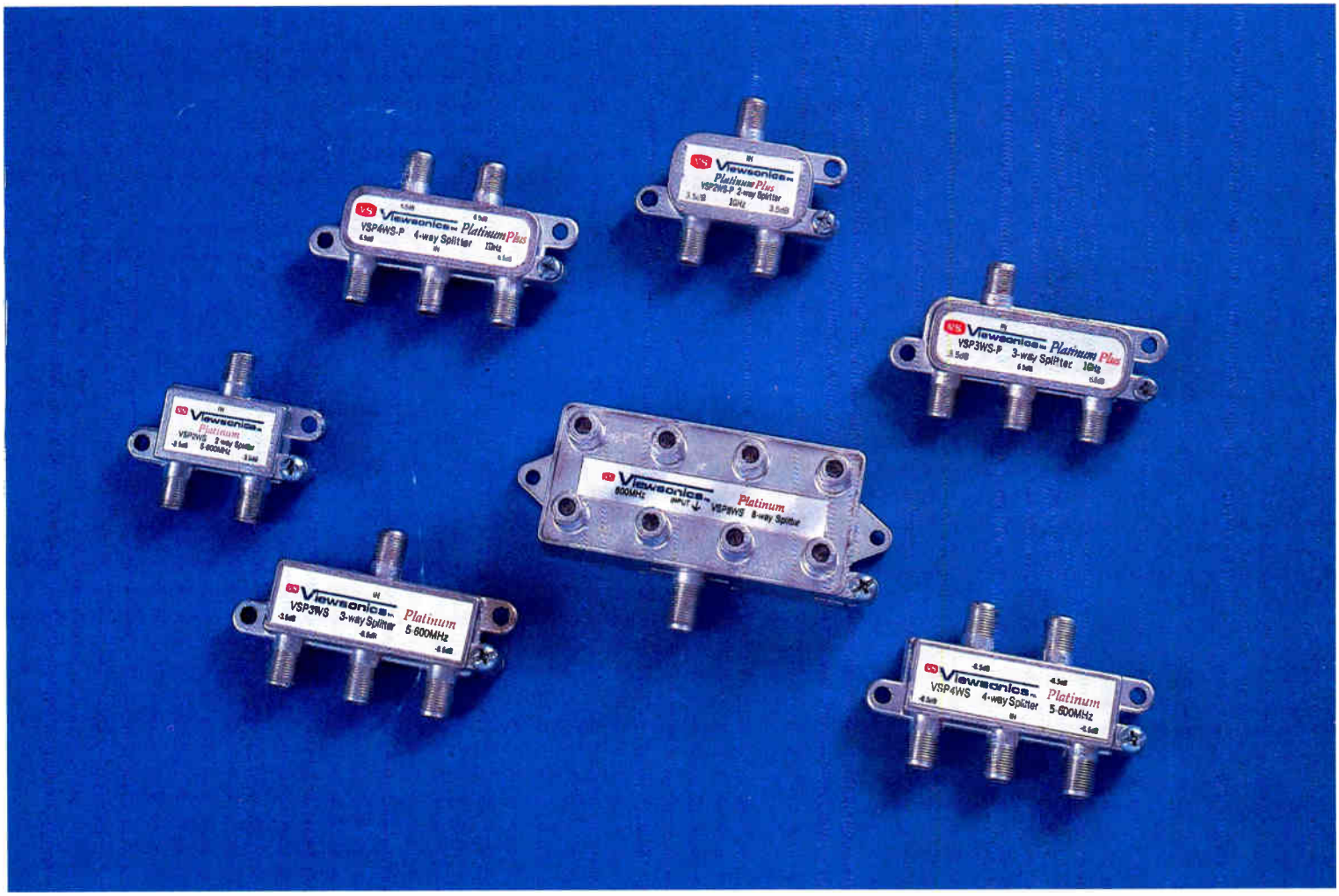


Figure 1

BREAK THROUGH TO THE 21ST CENTURY!



130dB RFI Shielding and 1GHz Bandwidth Platinum and Platinum Plus Splitters.

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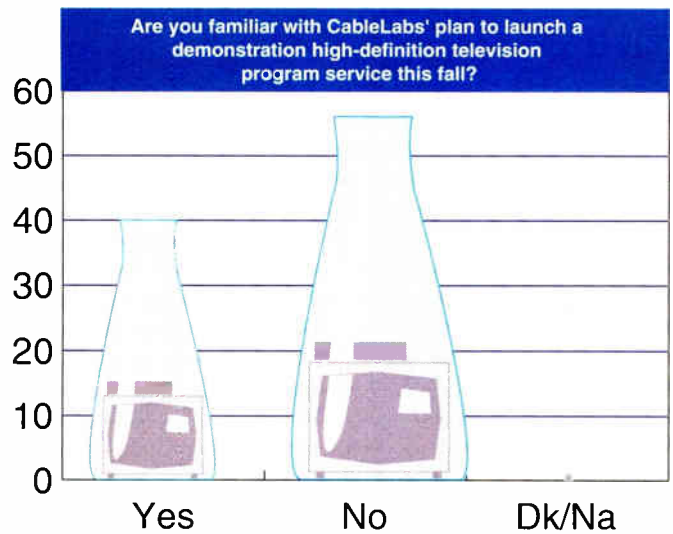
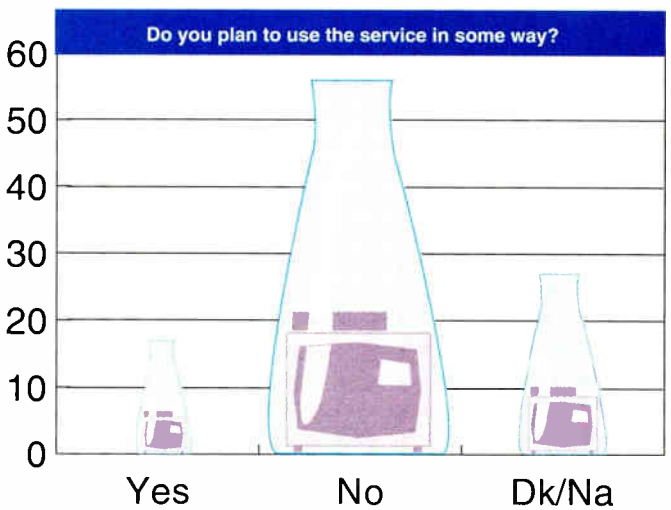
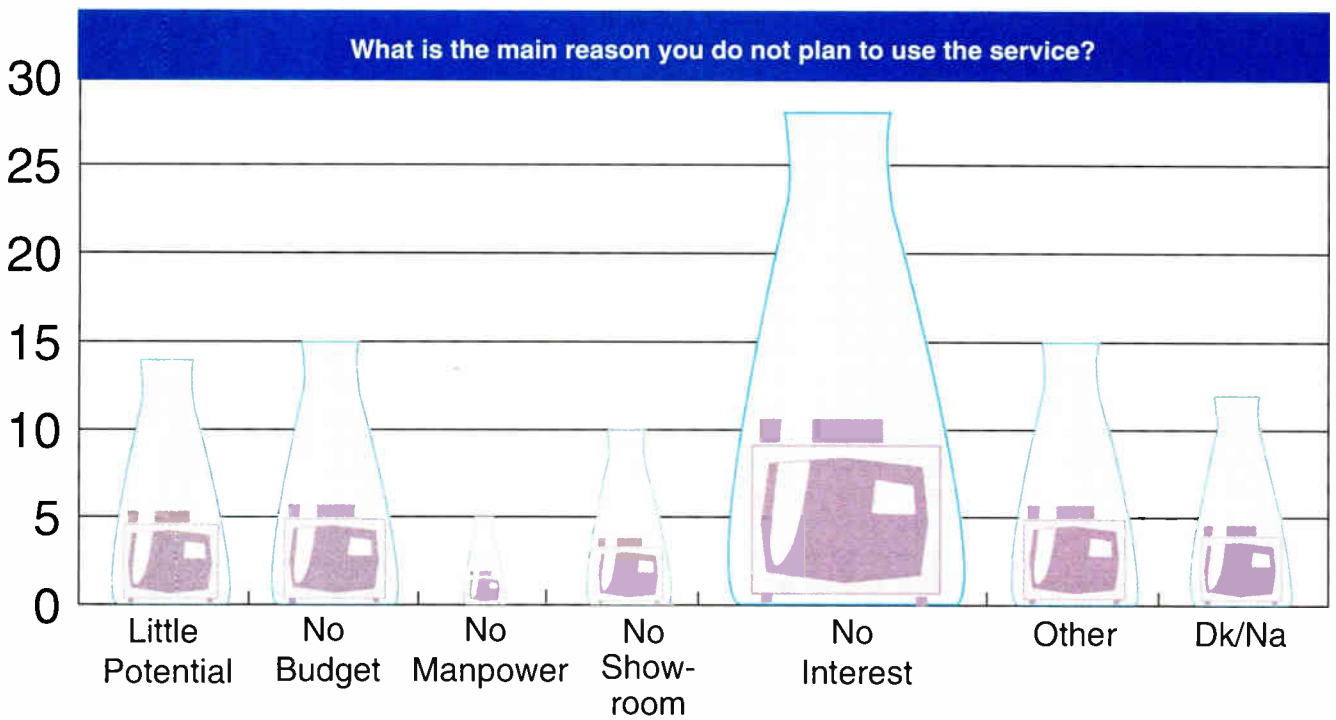
Operators hesitant about HDTV; 52 percent cite limited demand

In March, Cable Television Laboratories (CableLabs) introduced a plan to rollout a "regularly scheduled cablecast" of high definition television (HDTV) programming throughout the nation. The







idea was to demonstrate to the American public that the cable business is capable of providing advanced television services to its customers, and to show them what it looked like.

And according to CableLabs spokesman Mike Schwartz, the project is still slated to happen, although a few months later than originally scheduled. The cablecasts are now slated to begin "by the end of the year," instead of in September.

It's doubtful that system managers will be very torn up over the delay. According to a recent Cable Poll survey, a surprising 40 percent of the 405 system managers surveyed even know about the project.

Accordingly, most of the 405 system managers surveyed—56 percent—don't plan to offer the HDTV display service. Geographically, operators located in the West have the least desire to offer the service, at 61 percent.

System managers cited several reasons for taking a pass on CableLabs' HDTV service. Most prevalent, though, at 28 percent overall, was lack of interest. Other managers either didn't know (15 percent) or had "other" concerns (12 percent). Next ranked was lack of budget, at 15 percent overall, followed by limited immediate interest in HDTV services, also at 15 percent overall.

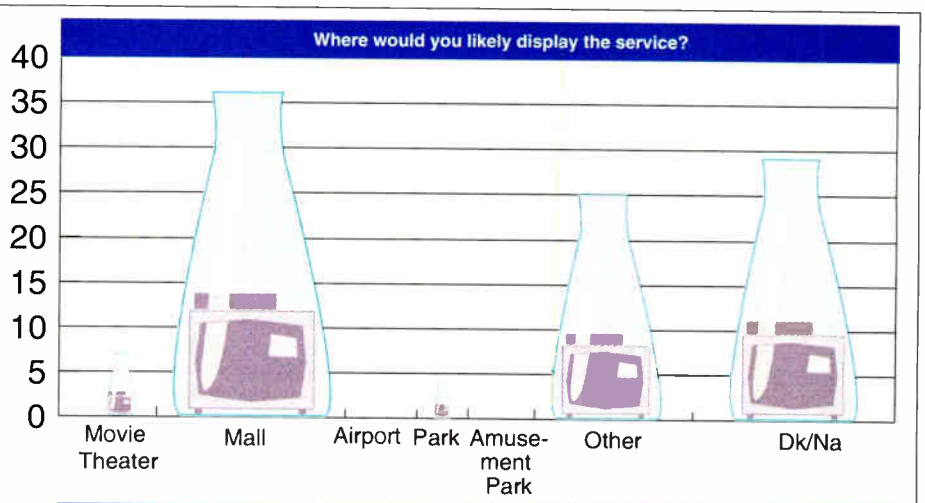
Indeed, according to the Poll, operators aren't convinced that HDTV itself is real-world stuff. Of the system managers polled, more than half—52 percent—expressed "little market demand" for HDTV. Another 18 percent saw "no market demand."

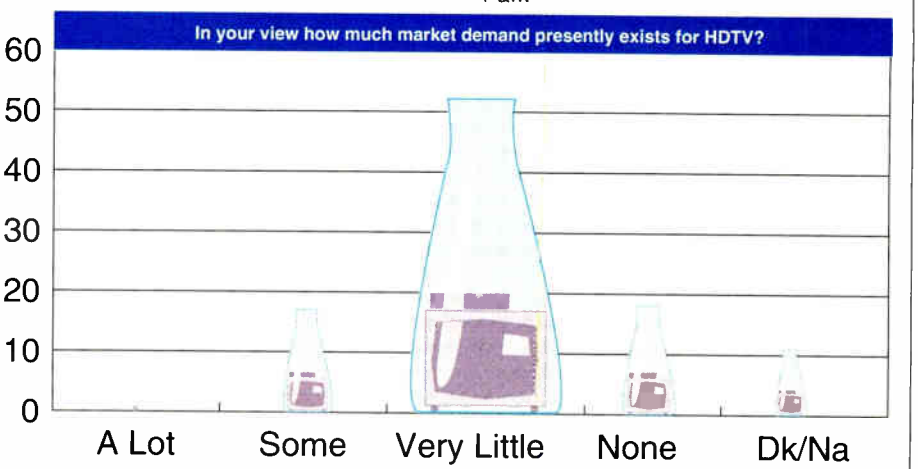
The 17 percent that did show interest in the Labs' HDTV efforts thought the service would best be displayed in a shopping mall location, at 37 percent overall. System operators in the Northeast were particularly interested in the shopping mall idea, with 50 percent responding positively. Other potential display areas include movie theaters (seven percent) and public parks (four percent).

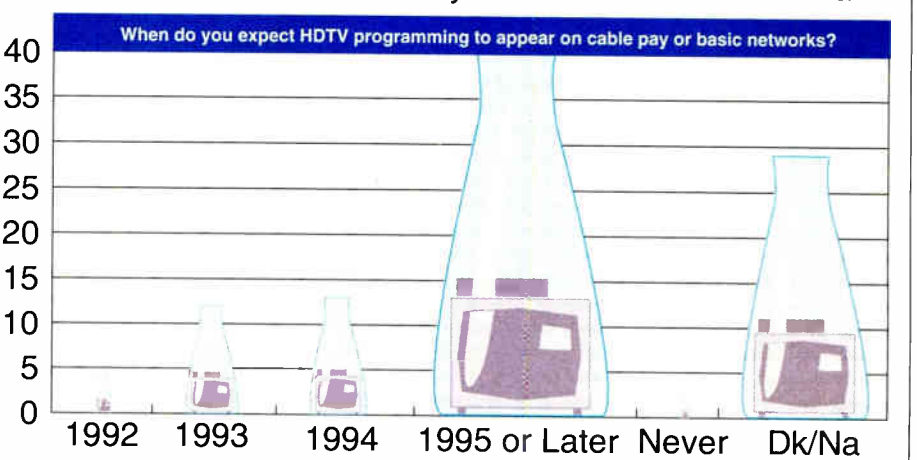
Operators, not surprisingly, have some serious concerns about costs, however. Half—50 percent—don't plan to transmit HDTV programming if equipment costs exceed $100,000. A $50,000 to $100,000 price tag still has almost half (47 percent) of system managers raising a red flag.

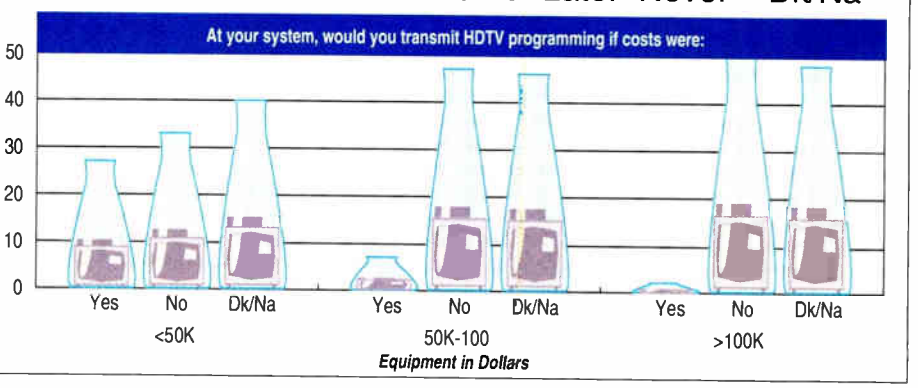
If equipment costs carried a price of less than $50,000, however, 27 percent said they would offer the programming.

—Leslie Ellis









Antec reshuffles executive deck

There's some rearranging going on in Skokie, Ill. John Egan, president and CEO of ANTEC, has announced a corporate reorganization of the execs leading the company's operating groups, including Anixter Cable TV, Optical Networks International (ONI) and Regal Technologies. Egan says the reorganization will better position the company to face the challenges of the 90's.

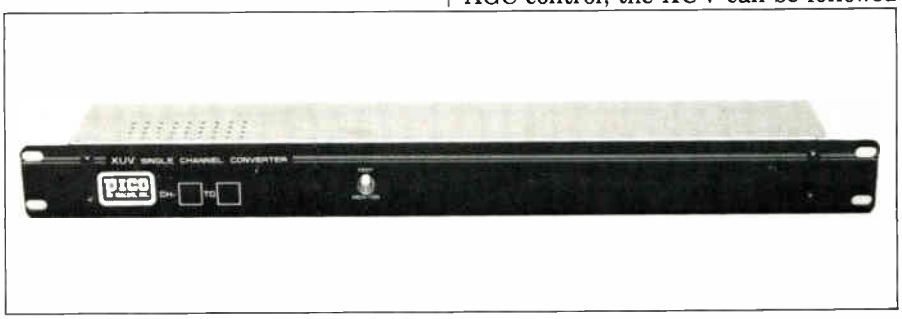
Gordy Halverson, a 22-year cable veteran with Anixter, has been named president of the ANTEC Cable Group. Under his helm, the newly created division will coordinate the sales and marketing resources of ANTEC's cable businesses.

Meanwhile, **Marty Ingram** was named president of Anixter Cable TV. Ingram previously held the position of VP, marketing and product development for Anixter.

Product news

UHF-VHF converters

Pico Macom has announced its New Look XUV converter, a crystal-controlled phase lock loop converter that converts UHF channels to any VHF channel in the low, mid or high bands.



Pico Macom's New Look XUV converter

The unit complies with FCC docket 21006 frequency offset and frequency stability requirements for cable television systems, with frequency stability factory set at +/- 5 kHz. All aeronautical channel offsets are also factory set.

Complete alignment procedures and PLL frequency charts are included in the XUV manual. The unit has 20 dB gain and accepts a zero dB input level. For additional output, filtering and AGC control, the XUV can be followed by a strip amplifier.

A two-year parts and labor warranty comes with the unit. For more information, contact Pico-Macom at (800) 421-6511 or fax inquiries to (818) 899-1165.

Motorola, Wegener ink deal

Wegener Communications has announced a contract with **Motorola Inc.** in Wegener will manufacture a new receiver/demultiplexor unit. An initial order stands at 250 units.

The product will be used in Mo-

torola's new EMBARC (electronic mail broadcast to a roaming computer), and will allow users of small "palm-top" computers to receive information anywhere in the country via high-frequency radio signals. The system will go into commercial use in the fourth quarter of 1991. The backbone for the system will be Wegener's satellite receiver, which meets the strict environmental and technical specifications Motorola requires.

"We at Wegener take this as an important sign that our quality commitment is contributing to opportunities with other quality-conscious corporations," says Bob Placek, Wegener president.

Fixed bandpass filter

CaLan Inc. has introduced a tubular fixed bandpass filter, designed specifically for cable television. The company's Model FF-xx Preselector Fixed Bandpass Filter provides high attenuation in the stopband and low insertion loss in the passband, company officials say. The universal design allows it to be used with any signal or spectrum analyzer.

To use the system, the line technician places it online to the sweep or analyzer input when making low-level distortion measurements in the presence of other high level carriers.

The FF-xx acts to extend the dynamic range of distortion measurement functions and attenuates unwanted adjacent carriers from 30 dB to 60 dB below the desired carrier's level. This prevents the creation of distortion products within the sweep system or spectrum analyzer.

Five-section filters are available with appropriate center frequencies for channels 5, 13, 14 and 36, and a seven section filter is available for channel 61. Standard F-type input and output connectors are provided, and each unit is optimized for the customer's frequency requirement prior to shipment.

The filters are available immediately. For more information, contact CaLan, (800) 544-3392 or, in Pennsylvania, (717) 828-2356.

Magnavox increases optical power

Magnavox CATV Systems has announced a 50 percent increase in its output power specifications on 3100 series externally modulated optical transmitters. The increase allows AM fiber optic links to exceed 20 miles and enable link arrays of under $6,000 per node.

Magnavox's Model 3102-TX, for example, is now specified at 15 mW optical power on each of its two output arms, totalling 30 mW. The unit previously carried a 20 mW specification. Similarly, the Model 3104-TX is now specified at 10 mW over four output arms, totalling 40 mW. The unit was previously specified at 7 mW/arm. Notably, the 3104-TX's new specification enables it to provide nearly 10 times the optical output power of the nearest alternative, a DFB laser transmitter, company officials say.

For more information on Magnavox products, call (315) 682-9105 or fax inquiries to (315) 682-9006.

MMDS automatic combiner

New from the **Microwave Filter Company** is the Model 9000SA channel combiner, which includes a voltage activated switch that disconnects the unit from the main line when a transmitter fails.

An electronic control box interfaces between the combiner and transmitter. Its purpose is to disconnect the combi-

ner during a transmitter failure so that a standby frequency agile transmitter connected to the main line wideband input can resume broadcast of the failed channel.

The unit is priced at $7,156 for a four channel, automatic combiner. A four channel mechanical combiner costs $5,888.

For more information, call (800) 448-1666 or fax inquiries to (315)-437-3953.

High-res distribution amp

ESE has announced its new ES-237 120 MHz distribution amplifier, designed to provide a low-cost solution to demanding video requirements including high definition television. Priced at $195, the 1x4 distribution amp features loop-through input and four isolated ports.

For more information, contact ESE at (213) 322-2136.

Fibertron opens facility

Fibertron Corporation, a specialty distributor of fiber optic cables, connectors, couplers, transmitters and other optical gear, has opened the doors to a new stocking and sales facility in East Hanover, N.J. Martin Rein, Fibertron's newly appointed general manager for its northeast facility, will maintain responsibility for sales administration and customer service in the new facility.

For more information, call Fibertron at (201) 515-9200 or fax inquiries to (201) 515-9269.

Earth station antenna control

Sunnyvale, Calif.-based **TIW Systems** has announced availability of its new Model AC3 antenna control system, designed for use with earth station antenna systems in satellite communications service.

The control and tracking system offers a monopulse tracking receiver, RF synthesizer for tracking frequency selection, polarization control, position conversion and display and remote computer interface.

Optionally, an IBM-compatible program tracking interface computer is available that features menu-driven displays of all antenna control functions as well as providing tracking functions for Norad, Intelsat, Star Track and Smart Track satellites in inclined orbit.

Also new from TIW is an 18-meter earth station antenna capable of simultaneous C- and Ku-band operation in Intelsat networks. The system is designed to meet Intelsat standard A and C specifications, and utilizes a single corrugated horn feed in a cassegrain reflector.

The antenna system is also equipped with the company's previously mentioned tracking system. For more information on TIW's new products, call (408) 734-3900 or fax inquiries to (408) 734-9012.

Catel appoints Canadian distributor

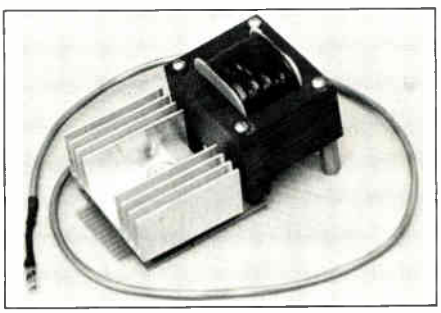
Catel Telecommunications has announced the exclusive appointment of Ontario, Canada-based **Angstrom Communications** to distribute Catel products in Canada's CATV and broadband markets. "The principals at Angstrom have demonstrated their technical competence in system and solution selling," says Jim Caldwell, VP of sales and marketing for Catel. "Their market focus fits well with our market philosophy."

For more information on Catel products or to get in touch with Angstrom, call Catel at (800) 827-2722.

Retrofit for Lectro

New from **Performance Cable TV Products** is a retrofit battery charger designed to replace existing units in Lectro Versatile standby power supplies.

The charger features a probe that reaches into the battery compartment, where it monitors the ambient battery temperature. Sensors built into the probe provide temperature compensation for the charge current and automatic cut-off when the battery temperature reaches 120 degrees Fahrenheit. If the batteries become discharged during high-temperature cut-off, an override circuit allows them to



Performance Cable TV Product's retrofit battery charger

recharge.

The unit's regulating charger is mounted on a heavy-duty extruded finned heatsink for better heat dissipation. The transistor is protected from short circuits by a foldback current limiting circuit. The output is factory set at 26 VDC and 77 degrees Fahrenheit, and automatically compensates for temperature changes at the rate of 0.04 V per degree Centigrade.

A solid state timing circuit uses a silicon control rectifier to control the transfer relays. The unit sells for $68, and is in stock. For more information, contact Jud Williams at Performance Cable TV Products, (404) 475-3192.

Printer option for Wavetek 1865 sweep

Cable Instrument Services Co. has released a printer option for Wavetek's Model 1865 Sweep Receiver. An expanded memory option (33 traces) is also available. For more information, call CISCO at (800) 359-5637.

New couplers, WDMs, enclosures

New from **Ipitek** is a singlemode series of couplers and wavelength division multiplexors (WDMs). Splitting ratios are selectable from 50:50 to 95:5 in either the 1310 nm or 1550 nm wavelength range. The WDMs offer other wavelength combinations for short wavelength applications and erbium doped optical amplifiers, company officials say.

Product specifications include less than 0.1 dB excess loss and a close tolerance on coupling ratio, resulting in low total insertion loss. All couplers are available with connectors, including low back reflection FC/PC, ST/PC, SC/PC and Super PC polish. Enclosures and rack-mounted versions for the connectorized couplers and WDMs are also available.

Also new from **Ipitek** is the company's FiberTrunk 600, a 600 MHz transmitter and receiver combination designed for RF transmission applications.

"This ultra-linear, low noise system is designed to support applications such as CATV supertrunking, subcarrier multiplexing, HDTV distribution and other multichannel video signal transmission installations," says Mark Curran, applications manager.

Additionally, Curran explains, the system "lends itself quite well to complete system integration, providing low-distortion, high carrier-to-noise signal transport over a 9.0 dB optical link budget."

The system is easy to customize, company officials submit, and enables the transport of multiple channels in a 600 MHz bandwidth. FiberTrunk 600 consists of Model 600T (transmitter) and 600R (receiver), which are linked with a single-mode optical fiber cable terminated with FC-PC super-polished connectors to "eliminate expensive, time-consuming splicing," officials submit. Indifferent to transmission format, the system uses a single DFB laser operating at 1300 nm. A pilot tone AGC operates regardless of transmission single continuity.

Customization and product brochures are available by calling Ipitek's Applications Center at (619) 438-8362, or fax inquiries to (619) 438-2412.

Self-supporting aerial cable

New from **Siecor Corp.** is an extension of its Mini Bundle fiber optic cable product line to include a self-supporting aerial design, designed for "easy and economical one-step installation."

The Figure-8 minibundle cable integrates Siecor's loose tube optical cable design with an asphaltic-filled, extra high strength (EHS) steel messenger. The assembly is jacketed with polyethylene into a figure-8 shape. The design allows the use of standard, copper figure-8 pole installation practices and attachment hardware during cable placement.

Siecor officials submit the new designed reduces installations steps from three down to one, because the new cable and its supporting messenger are integrated into one functional unit and installed simultaneously. The steel messenger carries installation forces and also bears the longterm, environmental loads sustained in aerial installations. For more information on Siecor's new cable, call (704) 327-5000.

Splitters, taps

Viewsonics has announced the introduction of its new Platinum and Platinum Plus series mini-splitters and mini-taps.

The Platinum series features 5 MHz to 600 MHz bandwidth; the Platinum Plus series extends bandwidth to 1 GHz. Both series offer a minimum 130 dB RFI shielding. All housings are tin plated and solder sealed, producing anti-corrosive protection.

For more information, contact Viewsonics officials at (800) 645-7600. ■

Industry loss


James Grabenstein

The cable industry lost another colleague last month when 35-year industry veteran **Jim Grabenstein** passed away. His death was caused by a heart attack. Grabenstein had a long and colorful cable career, dating from his early days at Potomac Valley Television, where he worked for 25 years as chief engineer. From there he moved on to Microdyne Corporation, where he worked as an applications engineer designing satellite television receivers.

Grabenstein is well-known in engineering circles, most notably for his design of one of the first FM processors for cable television.

He is also credited for developing the first feed-forward amplifiers for CATV distribution, engineering some of the first satellite TV receiving equipment used in cable and developing a variable directional tap. The rights to the tap were later sold to Spencer Kennedy Laboratories.

A long supporter of technical training, Grabenstein was an active SCTE member. He also spent a good part of his career working with the NCTA Engineering Committee.

Promotions, additions

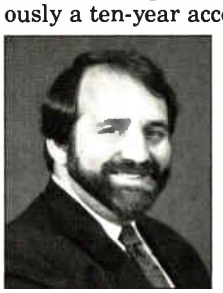
CableLabs has promoted **Suzanne Nielson** to publicatiions editor, where she will plan, edit and produce all CableLab's publications, including technical reports, monograph series, technical newsletters and seminar publications. Her background includes 15 years in high-tech, R&D positions and 14 years as a broadcast journalist in Europe and West Africa.

Also, the Labs has added **Larry J. Yokell** as senior analyst for competitive/strategic assessment, a new position. Yokell was previously employed as a competitive analyst for AT&T Bell Laboratories.

In his new role, Yokell will use his analytical skills and research capabilities to contribute to ongoing CableLabs R&D projects and to produce technical papers and reports.

Nexus Engineering has appointed **Lem Tarshis** to its board of directors. Tarshis was formerly the VP and general manager for the Distribution Systems Division of Jerrold Communications.

Cadco has added **Galen Yockey** to its executive staff, as the company's Western states, MSO sales and factory liaison manager. Yockey was previously a ten-year account manager for Mega Hertz, a Denver, Colo.-based distributor. Yockey and his family will remain in the Denver, Colo. area.


Chuck Dickey

Cable Data has announced three executive appointments. **Chuck Dickey** has been named VP of customer services for the company's International Billing Services division.


Joe Lagrossa


Connie Dotson


Paul Blevins


Tracy Cummins

Joe LaGrossa has been named VP of eastern regional operations. In his new role, LaGrossa will manage the Atlanta and Philadelphia service centers.

Also, **Connie Dotson** has been named VP of administration. Dotson has been the company's controller since 1986. She will now oversee human resources, MIS, business administration and employee communications.

Channelmatic has promoted two employees. **Paul E. Blevins** has been named VP of finance. He will be responsible for securing new sources of financing to support the company's growth plans.

Also, **Tracy L. Cummins** has been named director of operations, in charge of manufacturing, purchasing, inventory control, shipping/receiving and plant maintenance.

—Leslie Ellis

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SA 6650 Receiver $450
G.I. CM IV Mod. $450

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Universal remote controls

Life is full of disappointments. Things that seem like they should be a sure winner often fail to fulfill their promise. The "universal" remote control is one such example.

There are dozens of aftermarket universal remote controls for sale. Nearly all high-end televisions and VCRs now come with either universal remote controls or "multi-brand" remote controls.

The promise was that these units would make the interface between cable and consumer electronics easier. The subscriber would be able to toss all his coffee table remotes into the closet and use just one. It would be simple to set up, and simple to use.

What went wrong?

The variety of consumer electronics products, features and terminology is overwhelming. The number of different remote control codes used, even by a single brand, is staggering. There is no standardization. The reason for this is threefold.

First, there was little motivation for standardization of remote control codes. Secondly, some manufacturers have found codes and techniques which dramatically improve the sensitivity of their remote controls. They wish to keep these proprietary techniques because they yield demonstrable sales floor advantages. When one brand can accept remote commands from nearly any angle and other brands require careful aiming of the remote, any salesman worth his salt should be able to turn that into a sale.

Thirdly, some brands have gone too far in their cost-cutting. They use the lowest cost integrated circuits from a variety of suppliers, even though this means that remote control codes for the same products change from year to year or even from model to model in the same year. All these factors have made the universal remote control problem more complex.

Some thoughts

There are some thoughts that apply to the design of all remote controls used in cable.

These thoughts come from careful observation and use of a variety of products. The remarks may seem obvious, however, it appears that some remotes have been designed by people who have never watched television.

For starters, a very common design fault is the failure to consider that some of the most dedicated users of remote controls are a little older—some elderly—and others physically injured. For these subscribers, a good remote control design is a blessing. A poor remote control design is just another of life's increasing irritations.

There is no excuse for using numbers and characters that are smaller or thinner than will fit in the space allowed. It should be remembered that television is often watched in a darkened room. It is a shame to force the viewer to get his reading glasses just to be able to use the remote control. It is best to put the numbers on the buttons themselves. This is a bit more expensive, but it increases readability and decreases ambiguity.

The shape of the remote control should be narrow enough to be able to reach all buttons with the thumb. The buttons should accommodate even a large thumb, or one impaired by modest arthritis and certainly either a right or left thumb. The remote control should not require one hand to hold it and the other to push the button.

All normal functions should be executed with only one button. Shift keys, such as those found on scientific calculators or personal computers, should never be used. The only time holding down two buttons simultaneously should be allowed is for very special and deliberate functions which change the device. An example is when programming a universal remote control.

Buttons should be grouped logically. The mute button should be next to the volume control buttons. Up and down buttons for channel scanning and volume control should be rocker buttons. This helps to find them in the dark. The numbers should be arranged in telephone style, with "1,2,3" across the top; calculator style, which is inverted, should not be used.

In general, it is best for cable converter remotes to look most like consumer electronics remotes. We don't want to call attention to the fact that we are displacing the remote that came with the television or VCR.

It is useful to have an LED which is visible from the top of the remote and winks with every press of a button. This is a convenient battery indicator which can save a truck roll. The cable CSR can ask if the light works and suggest a battery before dispatching a truck.

As more converters begin using on-screen displays, they can be used to provide feedback to the subscriber and simplify usage.

There are a number of observations which apply to universal remote controls. More importantly, they should have non-volatile memories. The subscriber should not have to reprogram the device when the batteries go dead. It is not enough to have a few minutes worth of time to change batteries.

A common problem, for example, is to have the remote fall down between the cushions on the couch. The buttons are depressed and the battery runs down.

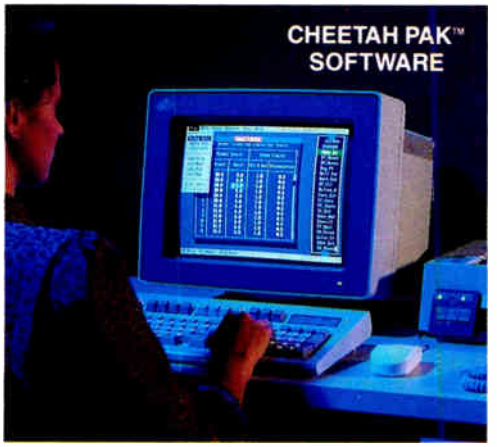
When the unit is found some time later, amidst loose change and cookie crumbs, the subscriber should not have to reprogram. Merely replacing the batteries is all that should be required to get back into business.

Another simple but important point for learning remote controls is to avoid a head-to-head configuration during programming which puts one set of buttons upside-down relative to the other set.

A head-to-toe configuration makes the process so much simpler, and reduces the chances of error.

Next month, we'll dig deeper into the special aspects and opportunities presented by the universal remote control. ■

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



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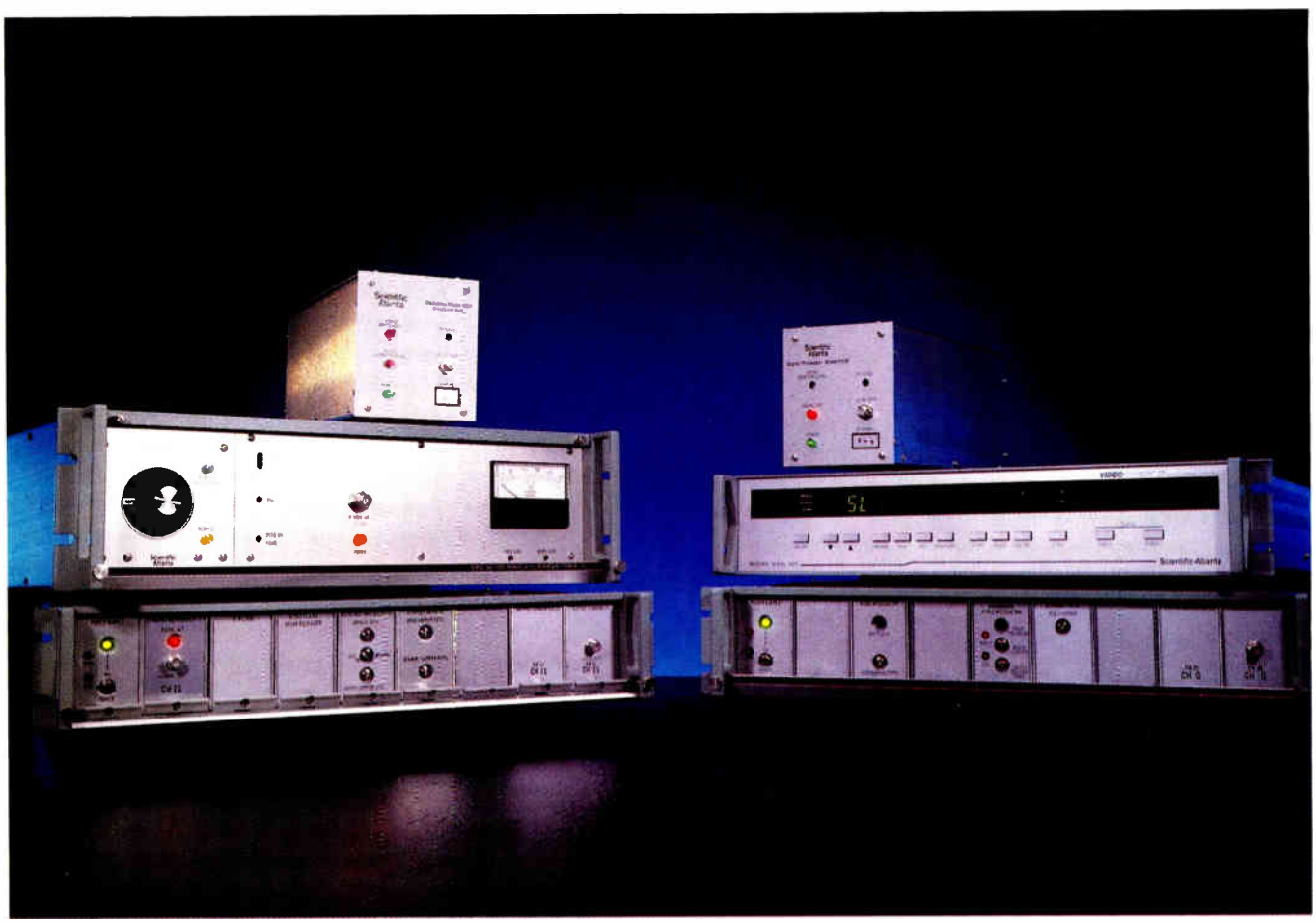

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