COMMUNICATIONS TECHNOLOGY

Official trade journal of the Society of Cable Television Engineers

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MAY 1993

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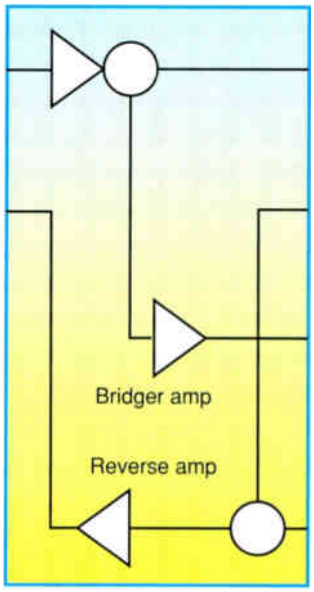
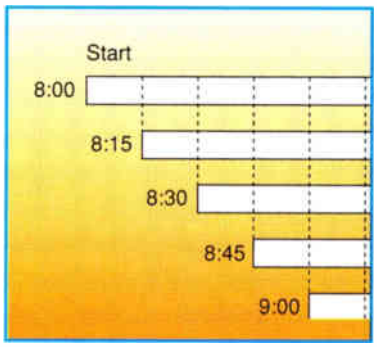
Reader Service Number 4

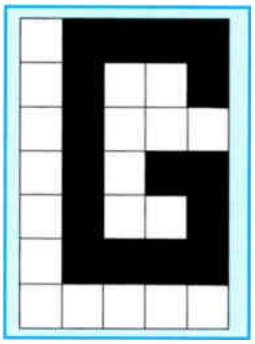
CONTENTS MAY 1993

Departments

Geri Saye







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Reader Service Number 8

EDITOR'S LETTER

The return of POP

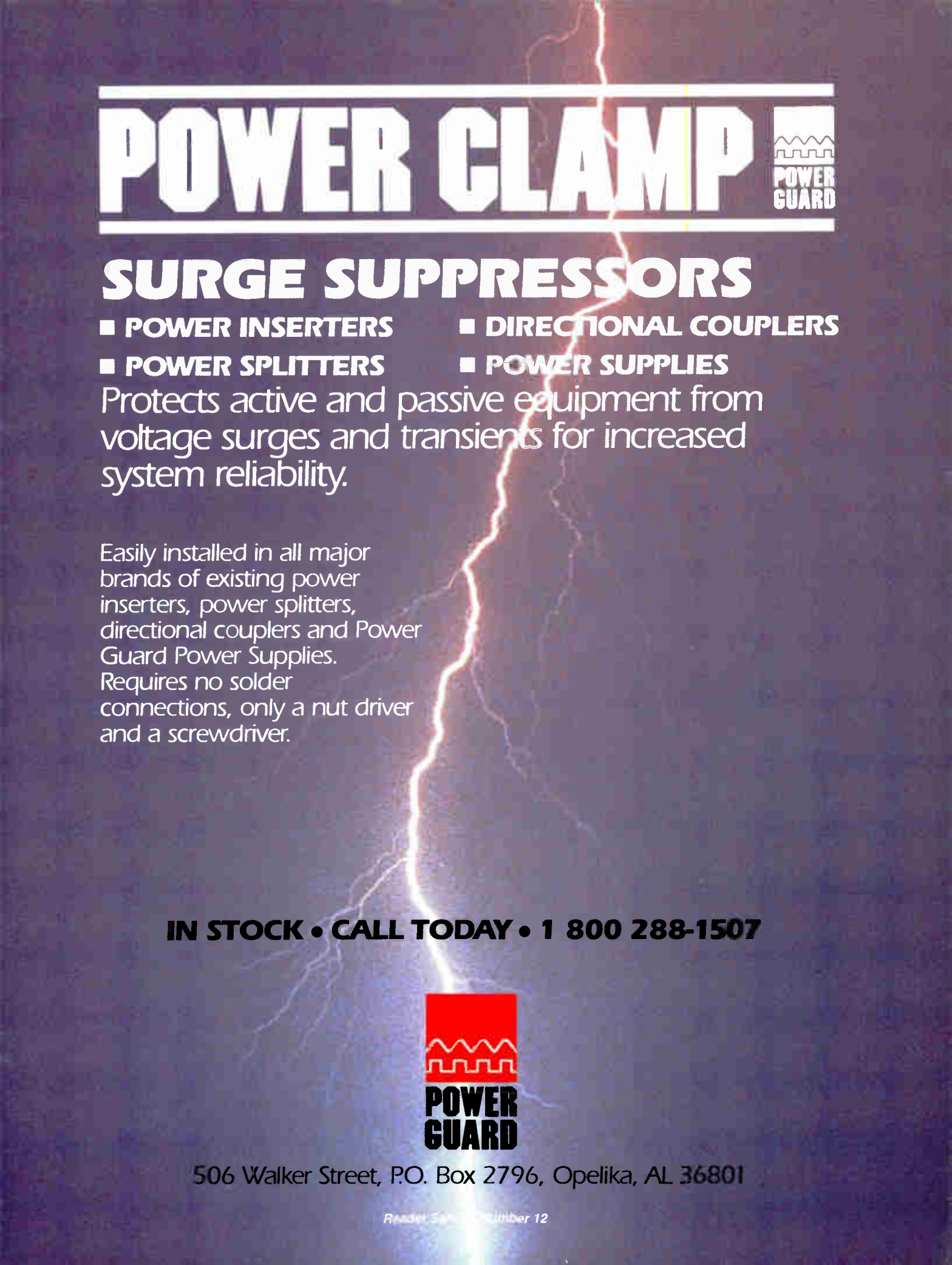
Proof-of-performance (POP) testing is back. Relatively new Federal Communications Commission regulations require us to make a variety of technical measurements of our systems, document the process, and place the information in our public files. This fairly straightforward effort is supposed to ensure that our customers are provided with a quality of cable reception above predefined thresholds. It also can be used as an internal benchmark to monitor overall system performance, and alert us to potential signal degradation problems. But is our house really in order?

I've heard of several instances where we may be having problems understanding or even complying with the intent of the FCC's technical regulations. Jonathon Kramer, president of Communications Support Corp., a CATV and telephony technical consulting firm for municipalities, has shared with me some interesting experiences. To date, he has visited about 35 systems around the country, conducting reviews of POP tests on behalf of local franchising authorities. These systems are in small towns and large cities and represent many of the major MSOs. Here are a few of the almost humorous situations he's come across:

- *Equipment calibration* — One operator listed his test equipment by make and model, serial number, etc., including date of last calibration. Pretty standard stuff. However, one piece of equipment, a spectrum analyzer, had last been calibrated in 1983. (This is not a typo!)
- *Qualified staff* — Proof documents should include a statement of qualifications of the individual(s) performing the testing: years of experience, education, licenses held, and so forth. In this particular case, the person listed only his name and title.
- *The public file* — After the testing is complete, the proof documentation is to be kept in the system's public file. An operator in Southern California "couldn't" provide the POP documents when asked for them. Both the general manager and plant manager said this was because of a "regional office decision." Another operator in a Midwestern system initially said OK to a similar request, then called back saying "no way," arguing Kramer was not a "member of the public." That general manager later changed his mind again when confronted with a copy of the FCC rules.
- *Cable with gain* — This operator decided to not only do the required measurements at the end of a simulated 100-foot drop, but also repeated them after adding a barrel and another 50 feet of drop cable to the first 100 feet, simulating a home's internal wiring in addition to the outside drop. Interestingly, signal levels were higher at the end of 150 feet of cable than they were at the end of the first 100 feet.
- *The perfect system* — How does a 59 dB carrier-to-noise ratio at end of a 29 dB amplifier cascade sound? One system had this figure recorded in its proof results.

When looking at these examples, it's easy to see that in some cases we seem to be missing the boat. Our POP documents should be accurate and complete enough that any other qualified engineer could review them and not have to ask questions. Further, before we put the results in our public file, we should ask ourselves, as Kramer puts it, "Why is this right?"

Ronald J. Hranac
Senior Technical Editor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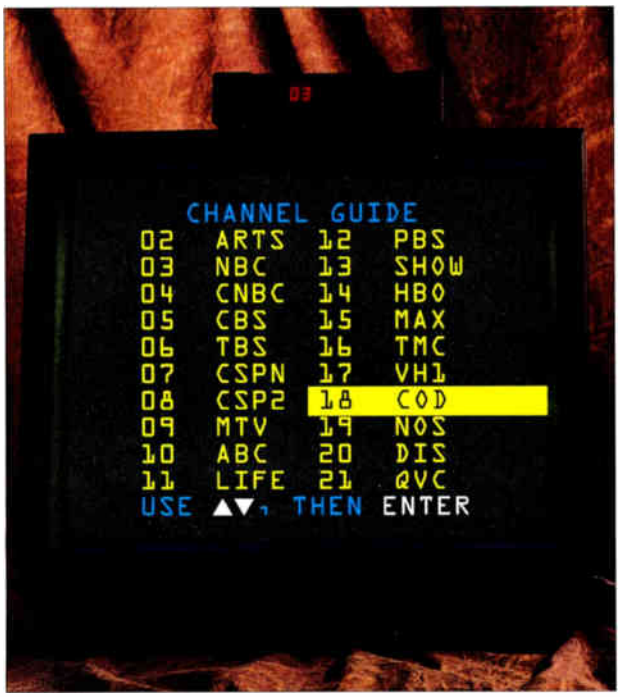

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Reader Service Number 20

LETTERS

Digital is overdue

A comment contained in the February 1993 issue of *CT* in "Blonder's View" was more than I could resist to respond to.

Isaac Blonder stated that he has not personally encountered one complaint about the picture quality of standard VHS tapes that exist happily in 70% of U.S. homes. Well, here is your first complaint. I think that the quality from VHS tapes presently in the home is substandard. I further believe that there are many who share my opinion. While there are many who cannot differentiate between a good picture or a bad one (or good vs. bad audio) there are many more who can.

Mr. Blonder surely remembers the atrocious picture quality of television in the '50s and '60s. Companies such as Blonder's introduced better antennas and amplifiers that greatly improved reception. Remember those days and how the viewing public exclaimed how good the pictures were, but by today's standards they were pretty bad. It's all in what one uses as a reference. The user is "happy" with the VHS tape quality because he has nothing better to compare it against, or because it is the standard format and anything else is too expensive and not compatible with the market.

I'm happy with the audio quality of the CD. I must continue to be "happy" with the quality of the FM radio in my car because that is all the industry has to offer.

I will not miss the multipath reception problems in my car, the ghosting on my TV set and the grainy pictures my cable company delivers to my home for a price that has now about reached the threshold of my tolerance.

Move forward with technology just for the sake of change? No. Move forward because the public expects more? Yes. I'm confident that it can be affordable if the industry is willing. I've been cabled for about eight years and still await good pictures. It's just that my definition of good is different than my cable company's.

Charles L. Kelsey
Mayville, NY

Are your traps bad?

If you have been using negative traps for the past 10 years, you've got a problem!

There are about four different manufacturers of outdoor notch filters and we use them all. I thought there was a bad run and I got them. We started a program to change out all traps on a tap while servicing or installing and bring the old traps in for test. There was a pattern — the older the trap, the more likely it was to have drifted. The older traps without the crimped end would allow moisture in. (I believe shortening their life.) Positive traps on the other hand will cause the sub to call for service when they drift.

Newer traps may allow the use of the lower adjacent channel and if you're running out of spectrum space this may be another opportunity to review your trap uses. You'll never get a customer to call to subscribe to a premium channel if he's getting it for free. Test your traps.

Arthur J. "Skip" Kraus
Kraus Electronic Systems

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With more broadcasters and CATV operators realizing the benefits and switching to fiber optic networks, the demand for "signal purity" and higher signal quality transmission has increased.

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For more information write to DX Communications Inc., 10 Skyline Drive. Hawthorne, NY, 10532 or call (914) 347-4040.

DX ANTENNA

Reader Service Number 24

Multimedia and cable: A match made in ...

WASHINGTON, DC — At the Interop show here last month, hosted by the Mountain View, CA-based Interop Co., vendors and network integrators revealed in the current state of network integration. Although the focus was on the tools and technology for integrating corporate computer networks together, it was clear that cable TV providers could play a role in this emerging infrastructure. Two of the hottest topics were multimedia and asynchronous transfer mode (ATM) — both of which could provide a means for cable companies to gain entry into this multibillion dollar arena.

George Wallow, a researcher at BBN Communications Corp., asserted that the fate of multimedia and ATM are combined. He believes that the need for multimedia applications will drive the deployment of ATM at all levels, from the local area network (LAN) up to the citywide networks in which cable companies could play a key role through their experience with video.

He sees multimedia as the ability to mix data, text, images and video within the same network. He projected several ways in which companies will use multimedia to improve the flow of information within their organization. Some obvious ones include videoconferencing and distance learning. Others include multimedia mail, electronic newsletters and the ability to download multimedia information from a distant server.

Multimedia mail would enable people to send video and text as they currently send voice-mail. This could go beyond simple talking heads, but may assist engineers who are trying to explain a problem involving some physical thing, like an airplane hatch. The electronic newsletter of the future might be interactive. Instead of just text, the recipient may be able to manipulate it and incorporate it into other presentations.

Multimedia servers are now enabling entire organizations to access the same visual information from different computers. Commercial products are starting to emerge that enable multiple computers on an Ethernet network to download video in real-time from a central server.

Chris Herot, director of multimedia development at Lotus Corp., said that these servers will change the way in which companies handle information. "A lot of the activity we see now is in bringing all of this messy information we carry around and using that to make better decisions. There are people in the business world that watch television all day."

Herot believes that video servers could play a role in integrating corporate networks with others. But these corporations will need a source of video. It may be internal, magnetic tapes, or perhaps even from cable TV. He said, "The communications environments are starting to come together. The technical capabilities of carrying video around are starting to come to-

gether. Incorporating video into your applications is not exotic anymore."

Herot also said that the initial markets for video over the corporate network will be news and accessing video libraries. Both are areas in which savvy cable companies could play a key role. He added that video news is becoming a staple in the stock market. He claimed that when Marlin Fitzwater began a report on the Persian Gulf War with the word "unfortunately," all of the markets had a noticeable dip in them.

News would not necessarily need to be live, such as CNN. It could be delivered in a packaged format along with a menu. That way corporate decision makers could go through the news important to them at their convenience. Herot said this approach may be applied to product catalogs as well. Instead of having to wait until the Home Shopping Channel or QVN offered merchandise, people would be able to navigate to the video sequence showing a product they were interested in.

James Long, with Starlight Networks Inc., made a presentation on the future of multimedia networking. Starlight produces a video server. He said that the incorporation of video technology into the corporate environment will proceed in three phases.

First, work groups with up to 500 computers on a LAN will begin to emerge. Then wide area networks will develop in which cable companies could play a role. Finally the era of collaborative computing will emerge in which people share all types of media with one another. He predicted that we will go from tens of thousands of video-capable personal computers last year, to millions in 1994.

Michael Kramer, a researcher at Morristown, NJ-based Bellcore, gave a presentation on their attempts to create an object-oriented signaling model called experimental ATM network system environment (EXPANSE). This will enable companies to manage the way in which video, voice and data are transported through networks independently of the underlying transport mechanism.

In a broadcast application, like the current generation of cable TV, the network would be set up so only a single station could control the content. But by changing the program, for a town meeting for example, any station could take control. The idea is that this same programming environment could be used to control ATM networks without getting into the details of how the network actually works.

Communications Industry Researchers (Washington, DC) launched the *Multimedia Networking Newsletter*. Although others have covered multimedia in the past, this is the first newsletter to focus on how multimedia will operate across networks. It covers multimedia information services, multimedia trials by CATV operators, broadcasters and telephone carriers, and the whole gamut of emerging broadband technologies for carrying multimedia across local and wide area networks. CIR can be reached at (202) 296-0877.

A number of companies demonstrated ATM switches at the show. These included Hughes Network Systems (Germantown, MD), General Datacomm Inc. (Middleberry, CT), Cascade Communications Corp. (Westford, MA) and Newbridge Networks Inc. (Herndon, VA). Most of the available products were targeted at high-speed applications (622 megabits per second and above) and included a hefty price tag that would make it unreasonable except as part of a large network ($3,000

per port and up). But Newbridge Networks claims that it will drive the price of ATM down to under $500 per port by the end of the year.

The focus of Interop was the interoperability between different types of data networks. It is clear that focus is expanding and could provide cable companies with a new market opportunity — if they seize the day. — *George Lawton*

FCC rate regs: "Competitive" levels

WASHINGTON, DC — The Federal Communications Commission adopted rate regulations for cable TV systems that it reported will affect up to three-quarters of cable systems and cable subscribers across the country. The FCC put out a press release stating, "The commission estimates that the potential total benefit to consumers of this initial step could be about $1 billion."

The FCC ruled that every cable system that is not in a competitive marketplace, as defined by the 1992 Cable Act, will have its "reasonable" rate determined by a formula based on the pricing practices of systems that do face competition. Local franchising authorities and the commission will be able to reduce the rates of systems whose rates are above this "reasonable" level by up to 10%.

The FCC also said, "To negate the effects of any unjustified rate increases that may have occurred since the adoption of the Cable Act in October 1992, such rate reductions will be applied to rate levels as of Sept. 30, 1992.

"Cable systems whose rates are already at or below the reasonable level as determined by the formula will not have to reduce their rates. However, the extent to which they will be able to raise rates in the future will be subject to regulatory caps."

In a separate but related action, the FCC froze for 120 days all cable rates in effect on April 5, 1993, other than rates for premium and pay-per-view (PPV) program services and equipment.

"The commission anticipates that its cable rate regulations will become effective approximately 75 days after adoption of the *Report and Order*," the FCC says, "Thus, as a practical matter, it will take an additional period of time for franchise authorities to become certified to regulate basic service rates and for consumers to be able to file complaints to invoke commission oversight of rates for cable programming services."

TCI unveils superhighway plans

DENVER — Heavy media coverage in newspapers and on local news programs here has marked Tele-Communications Inc.'s announcement that it is taking a lead in developing a nationwide "superhighway" by rewiring its cable system with 7,000 miles of fiber. About 300 TCI systems will be upgraded.

Benefits of the upgrade could eventually include video-on-demand, interactive shopping services, and the ability to transmit computer data and telephony.

"TCI expects to start offering 500-plus channel service nationally next year," *The Denver Post* reported.

CableLabs adds,expands subcommittees

BOULDER, CO — Cable Television

Laboratories has restructured the focus of its technical advisory subcommittee that deals with the delivery of voice signals.

It established a Telecommunications Subcommittee that will advise staff and membership on research into personal communications services (PCS), competitive access provision (CAP) and the delivery of voice via wired solutions. This subcommittee previously focused just on PCS. It's chaired by Mark Coblitz, vice president, strategic planning at Comcast Corp.

Also, CableLabs established the new Multimedia Subcommittee to help coordinate its efforts with the computer industry. It's chaired by David Fellows, senior vice president of engineering and technology with Continental Cablevision.

New company to help MSOs in telephony

ST. LOUIS — Brooks Telecommunications Co. based here has established a new company to assist cable TV MSOs and other competitive access providers participate more fully in the rapidly growing competitive telecommunications market.

Brooks Network Services reportedly provides a flexible and comprehensive service menu for MSOs considering or already in the competitive telecommunications marketplace. BNS is already working with several clients, including Texas-based KBLCOM and New York-based FiberNet.

☛ The Pirelli Communication's Division's Lexington, SC, facility has become the first Pirelli Cables North America (PCNA) facility to earn ISO 9001 Certification. It also is the first fiber-optic manufacturer to be registered by Bellcore Quality Registration, according to the company.

☛ Siecor will construct a new state-of-the-art fiber-optic cable manufacturing plant in Winston-Salem, NC. Construction of the new 215,000 square foot facility will begin immediately and manufacturing operations are expected to be underway by mid-1994.

☛ TeleCable Corp., the nation's 19th largest MSO, said it would roll out Jerrold-General Instrument addressable technology in as many as 100,000 subscriber homes. In addition, the company signed a letter of intent to purchase up to 50,000 DigiCable digital compression units from Jerrold.

☛ TCI announced the implementation of a software facility developed by Boulder, CO-based Probita Inc. that will give TCI central command and control of one of the initial centerpieces of its compressed digital programming package, a multiplex PPV movie service. The new facility allows TCI to process incoming PPV requests from its third-party billing systems at TCI's addressable computer center (TAC) outside of Denver.

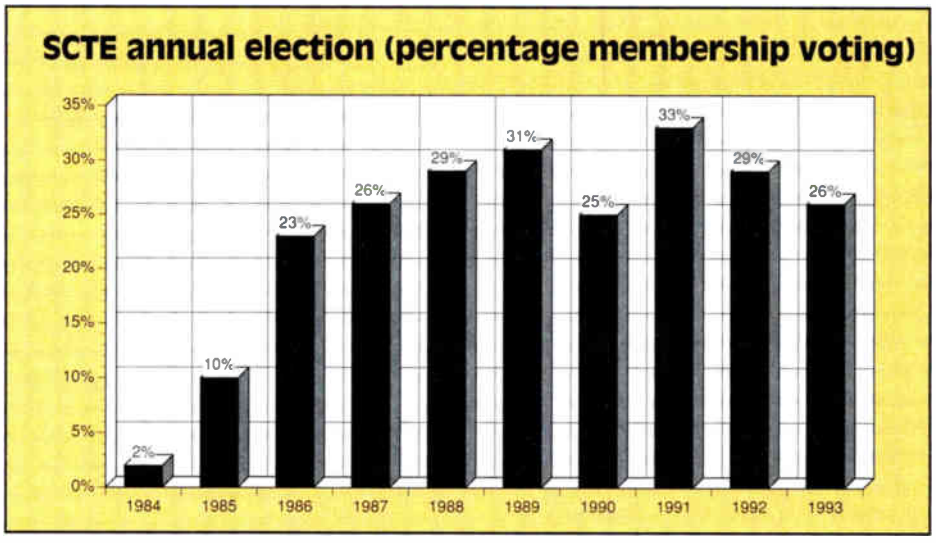
☛ Cencom Cable changed its name to Crown Cable.

☛ Buckeye Cablevision filed suit in U.S. District Court against 97 people, accusing the defendants of tampering with the converter boxes it put in their homes. Buckeye seeks from each defendant the following: statutory damages of $10,000; actual damages the company has suffered plus any profits the defendants realized, to be determined in trial; damages for all violations committed willfully and for the purpose of financial gain; breach of contract damages; fair market value of the allegedly converted property; and court/attorney's fees.

Society elects new board members

March 29 marked the official closing of the SCTE annual election. Results are:

- At-Large, Wendell Bailey, NCTA, representing the entire United States, 26% of eligible voters participating.
- At-Large, Wendell Woody, ANTEC, representing the entire United States, 26% of eligible voters participating.
- Region 1, Steve Allen, Jones Intercable, representing California, Hawaii and Nevada, 24% of eligible voters participating.
- Region 2, Pam Nobles, Jones Intercable, representing Arizona, Colorado, New Mexico, Utah and Wyoming, 35% of eligible voters participating.
- Region 6, Robert Schaeffer, Star Cablevision Group, representing Minnesota, North Dakota, South Dakota and Wisconsin, 35% of eligible voters participating.
- Region 9, Hugh McCarley, Cox Cable Communications, representing Florida, Georgia and South Carolina, 28% of eligible voters participating.



- Region 11, Diana Riley, Jerry Conn Associates, representing Delaware, Maryland, New Jersey and Pennsylvania, 33% of eligible voters participating.

They will join SCTE board members currently serving their 1992-1994 terms:

- At-Large, Tom Elliot, TCI, representing the entire United States.
- Region 3, Norrie Bush, Columbia Cable, representing Alaska, Idaho, Montana, Oregon and Washington.
- Region 4, Bill Arnold, Texas Cable TV Association, representing Oklahoma and Texas.
- Region 5, Mark Wilson, Multimedia, representing Illinois, Iowa, Kansas,

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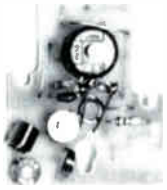

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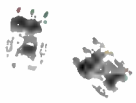

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Missouri and Nebraska.

• Region 7, Terry Bush, Trilithic Inc., representing Indiana, Michigan and Ohio.

• Region 8, Jack Trower, WEHCO Video, representing Alabama, Arkansas, Louisiana, Mississippi and Tennessee.

• Region 10, Mike Smith, Adelphia Cable, representing Kentucky, North Carolina, Virginia and West Virginia.

• Region 12, Walt Ciciora, Ph.D., ATC, representing Connecticut, Massachusetts, Maine, New Hampshire, New York, Rhode Island and Vermont.

Newly elected directors officially took their seats at the SCTE board meeting prior to Cable-Tec Expo '93.

Awards presented at Expo '93 luncheon

SCTE held its Annual Awards Luncheon at Cable-Tec Expo '93 in Orlando, FL. The following were recognized:

• Expo Program Subcommittee members William Riker and Dave Spallinger (co-chairmen), Roger Brown, Dean DeBiase, Jim Farmer, Paul Levine and Mike Smith received awards for their efforts for Cable-Tec Expo '93.

• The Program Subcommittee of the Emerging Technologies 1993 conference was recognized for its efforts in the planning of the January conference. Receiving awards were: Tom Jokerst (chairman), Walt Ciciora, Ph.D., Tom Elliot, Dan Pike, Bill Riker and Kevin Smith.

• The following were recognized for their contributions as technical program coordinators at regional cable shows: Dan Pike (1993 Texas Cable Show); Diana Riley (1992 Atlantic Cable Show); Tom Elliott and Bill Riker (1992 Western Cable Show), and Ralph Haimowitz and Rich Henkemeyer (1993 North Central Cable Show).

• SCTE Personal Achievement Awards, established (based on the SCTE Outstanding Achievement Award) to recognize technical personnel for outstanding performance, were presented to Robert Baker and Charles Nydegger.

• The former Adirondack, Northern New England, Ozark Mountain and Shasta/Rogue Meeting Groups all were elevated to full chapter status in the Society.

• Outgoing members of the SCTE board of directors: Tom Elliott (Region 1), Ron Hranac (Region 2), Mark Wilson (Region 5), Rich Henkemeyer (Region 6), Jim Farmer (Region 9) and Richard Covell (at-large).

• Richard Abraham, Jerry Kittelson, Jonathan Ridley, Joe Van Loan and Dane Walker were elevated to senior member status in the Society.

• Hewlett-Packard was the recipient of the 1993 Chairman's Award in recognition of its support of the Society.

• Mel Welch of Genesis took first in SCTE's third annual Field Operations Award competition. Dick Hall of TCI and Enrique Lomas of Times Mirror took second and third place respectively.

• Steve Bell was inducted and James Grabenstein was posthumously inducted into the SCTE Hall of Fame. In 1988, SCTE created its Hall of Fame and honored Cliff Paul as its first inductee. The second inductee, Len Ecker, was honored at Cable-Tec Expo '91, and at last year's Expo, Rex Porter, Jim Stilwell and Dave Willis were inducted.

• William Grant was the 1993 recipient of the Society's Member of the Year Award. Among his SCTE activities is speaking in a series of videotapes done for the Society based on his book, *Cable Television*.

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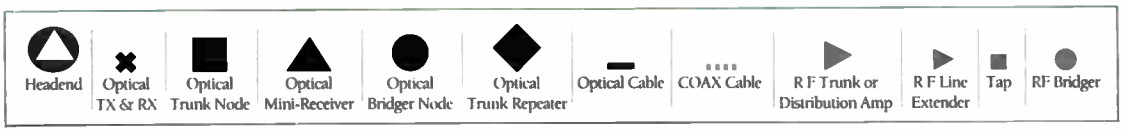

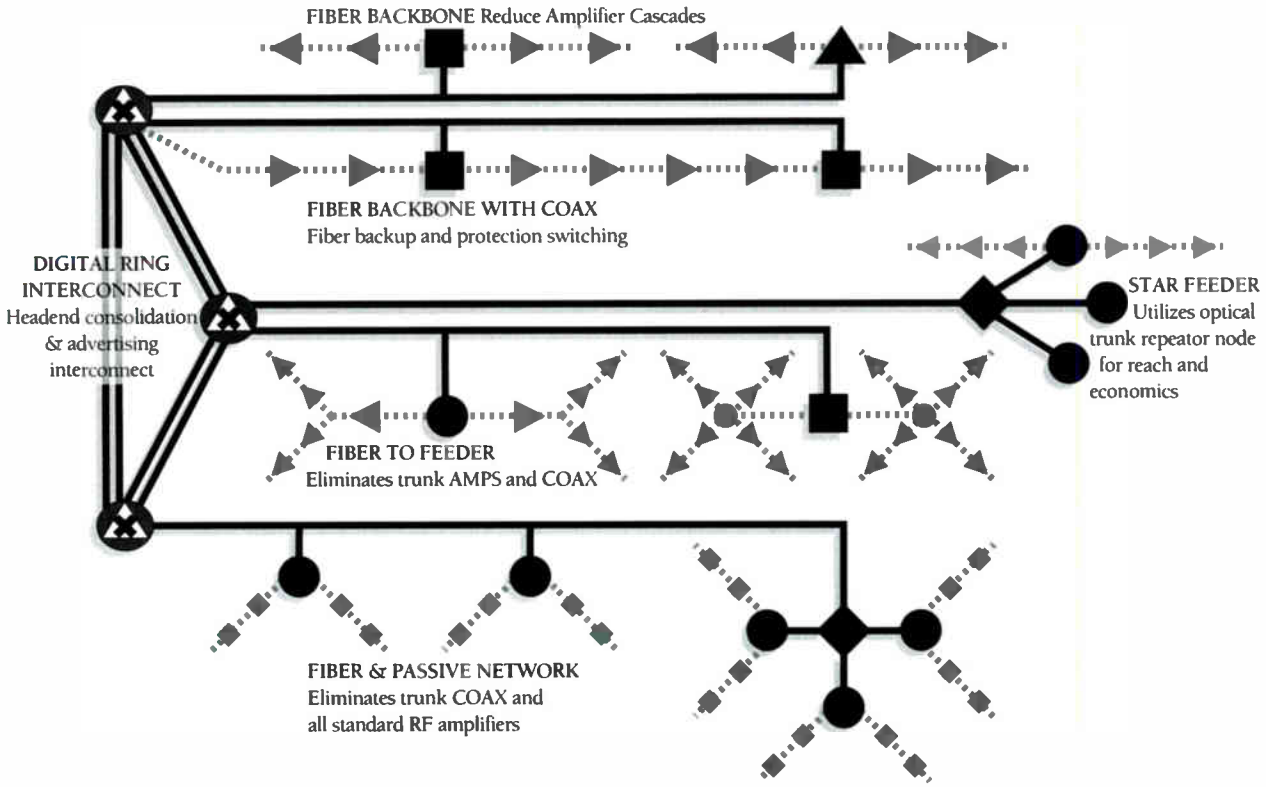

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Reader Service Number 35

Impulse PPV technology: Is today's much different (or better) than yesterday's?

By Bill Spies
Director of Engineering
Warner Cable Communications Inc.

The advent of video-on-demand will bring more people into the world of impulse pay-per-view (IPPV) with the ensuing discussion probably geared toward revenue opportunities. I feel that it is just as important to focus on the technical aspects of IPPV and how our systems' operations will deal with the introduction and/or improvements in IPPV technology. In some cases the lack of knowledge will result in lost revenue.

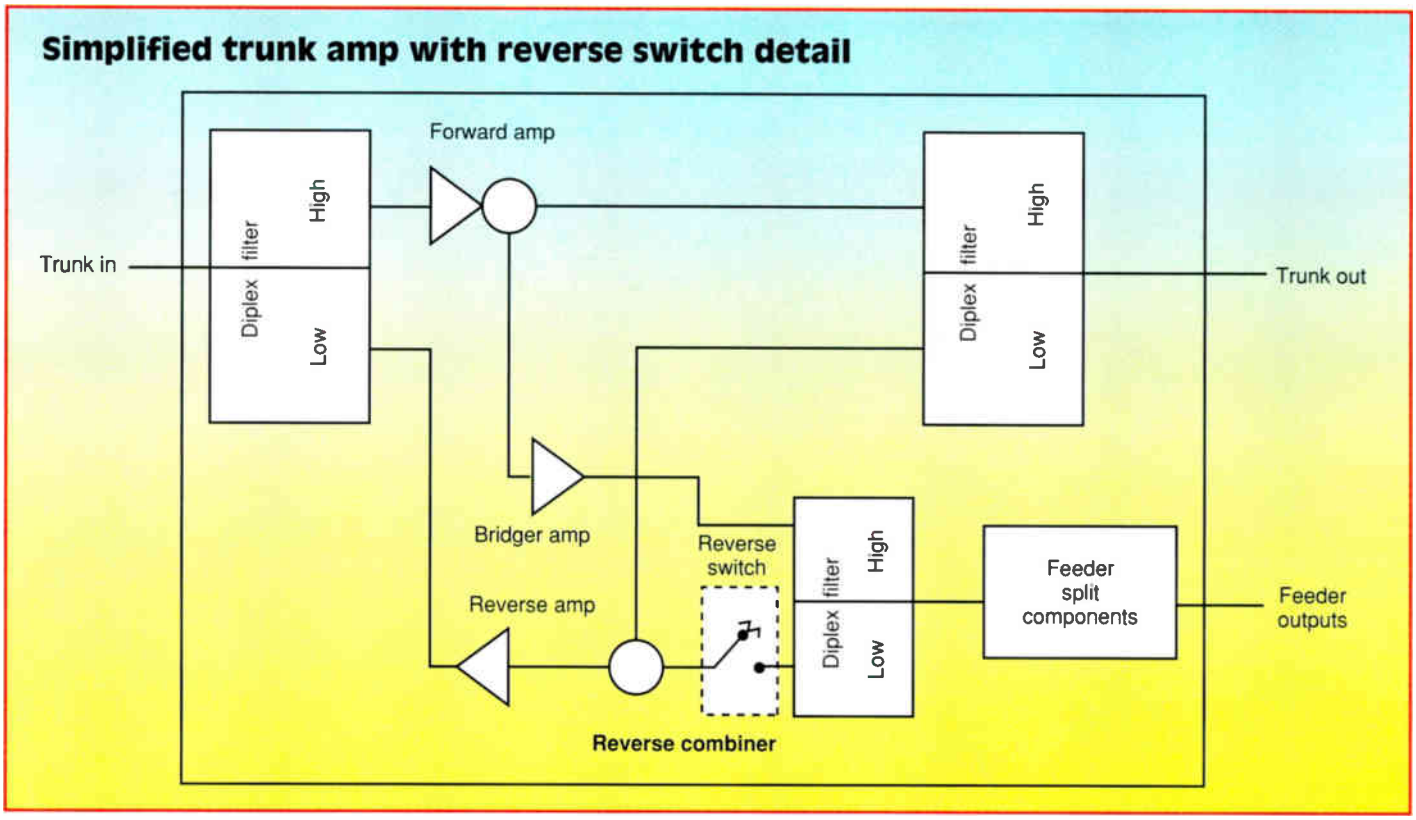
As the title implies, there are at least two different types of IPPV technologies. Being from Cincinnati, where Qube technology has been providing IPPV capabilities since 1980, the focus is normally on running a real-time, IPPV system. However, as more systems are upgrading and changing converters, IPPV technology and its operation are two recurring topics of discussion. Although this article could delve into a very detailed analysis (if space permitted), it will instead provide an overview of Qube technology and operation, store-and-forward technology and operation, and a comparison.

Yesterday's IPPV — Qube

Qube was launched in the '70s as a venture by Warner Cable to bring interactivity to the cable customer. Live polling was performed and TV programs were produced to allow viewer interaction. One type of program asked the viewer to answer questions during the show with the winner declared at the end. And, Qube became the way to provide IPPV. As the years went by, viewer interactivity faded but the use of Qube's two-way, IPPV capabilities remain.

Qube is a real-time, data acquisition system that polls the converters and obtains responses. The nature of the poll, as it concerns IPPV, is to ask the converter what channel is being watched. The response comes

Simplified trunk amp with reverse switch detail



back to the headend via a reverse cable path in the 5-30 MHz band. The data is collected by a main frame computer that analyzes the responses and makes a determination concerning billing. If an event is watched for the minimum period of time, then the system declares that the viewing of an IPPV event took place and the appropriate billing information will show up on the customer's account. This seems like a simple process but there is much more.

First, Qube is an addressable, two-way, interactive system utilizing cable return. For Qube to work, several design- and equipment-specific issues were implemented, chiefly relating to the reduction of system noise on the reverse path and the downsizing of the system for the forward instructional signal. The cable system is segmented in several areas called bidirectional communications units (BCUs). From the standpoint of the Qube converter, each BCU area appears to be a stand-alone cable system. Qube converters are not globally addressed. Each BCU has its own separate forward data signal (using frequency shift keying — FSK) that is used to instruct the Qube converters, among other functions. The data signal is out-of-band.

During the course of the day, the controller polls each converter every minute or so. Polling speeds are in the order of 200,000 boxes per minute. The poll asks the converter to respond with information regarding its status. For IPPV to work, the converter responds to two questions: 1) Is the converter on or off? and 2) What channel is being viewed? The converter transmits the answers in the form of a PSK (phase shift keyed) signal at a data rate of approximately 256 kbps. No handshake is available for the response. Because there are so many polls, one per minute, a handshake would be useless. The collection of the viewed channel data is important because in a Qube system, specific channels are designated to be IPPV channels. So any responses that indicate viewing on an IPPV channel will be tabulated. Ten positive IPPV channel responses during an event will trigger generation of event billing on the customer's account. Some system problems can get in the way of obtaining responses, such as the buildup of noise in the reverse path.

"Polling speeds are much faster with Qube than the store-and-forward systems — 200,000 converters per minute vs. perhaps 50,000 per hour."

The Qube response is not immune to noise. To minimize its effect, each trunk amplifier in the BCU area is outfitted with the ability to switch on and off the reverse signal coming from its feeder legs. This is called bridger gate switching or bridger switching. The purpose of bridger switching is to dissect the system into many reverse paths, allowing only one reverse path at a time to respond. Since noise adds in both parallel and series cascades, segmenting and switching the reverse keeps the noise to an acceptable level. All reverse switches are normally open (gates closed). (See the accompanying figure.) The polling computer turns on Amp #1's switch and sequentially polls each converter, allowing only one converter to respond at a time. After all converters in Amp #1's feeder area have been polled, the computer turns off Amp #1's switch and turns on Amp #2's. Again, each converter is sequentially polled. This process is repeated until all trunk amps' switches have cycled closed and open, and every converter polled. Polling takes place in all BCUs at the same time.

The process of collecting the data and generating billing is more complex as well. The main frame computer/controller receives the data independently from each BCU via a PSK receiver and data modem. The computer system uses a definable threshold for determining the number of polls required to substantiate that "watching an event took place." The collected data is matched against the threshold and a determination of billing is generated. An interface to the billing computer, either through a direct link or mag tapes, expedites the generation of the billing entry onto the customer's bill.

The Qube system with its real-time capabilities is adept at providing the status of the converter. One of the status features, mentioned earlier, is used for IPPV purchase determination. There are two other major status-using capabilities.

One is the generation of viewership statistics. This service is being sold to some programmers in the form of ratings and shares by channel by time blocks. Another feature is outage detection with pinpoint location.

Since the converter status includes whether or not it's getting the signal, a program was written to show the number of converters responding. The results are displayed on computer screens in dispatch. Since every converter is tracked in the billing system by trunk amplifier number, any downward change in the percentage of terminals responding indicates an interruption of the reverse path. Indicators on the screens display the data, and personnel declare an outage if the data shows massive numbers of failures. The failures could be in an individual trunk amp area (feeder) or multiple trunk amps (trunk). Pinpointing its location is straightforward by virtue of reviewing the farthest downstream point where polling and responses are still being received with positive results. These failures are outages, either forward outages so that the converters don't know to respond or reverse outages such that the control system doesn't hear the response.

Operating with Qube

Operating a Qube system requires focus on the plant and converters so that the inherent shortcomings do not reduce the revenue potential of IPPV. There is an increased focus on plant maintenance. Any problem with the reverse path leads to the inability to get IPPV data. Quality of the Qube converter is very important. Thirty-four people are dedicated to repairing converters, ensuring that all aspects, including the two-way modules, are working properly.

Remember that billing is generated according to responses. If converters don't respond to the polls, then the computer system cannot tell if an event was watched. So billing will not be generated. A converter that doesn't respond is commonly called a no-answer converter. There are several root causes to the no-answer problem.

First, the converter could be defec-

(Continued on page 44)

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Movie-on-demand: The next step for PPV

This article was adapted from a presentation given last month at CableTec Expo '93 in Orlando, FL.

By Paul A. Harr
Marketing Manager, Scientific-Atlanta Inc.

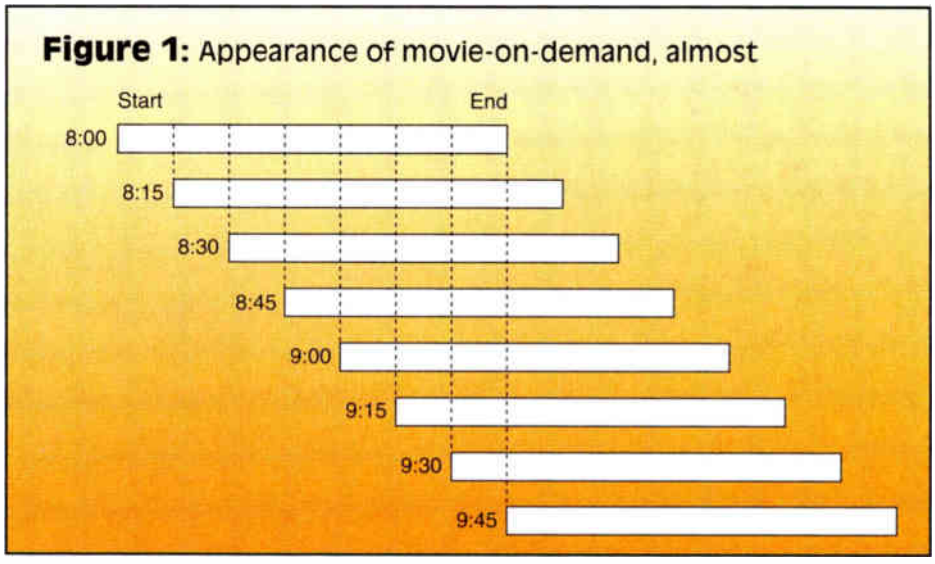
Pay per-view (PPV) technology has consisted primarily of conventional order-entry techniques and addressable technology. These techniques have included customer service reps, audio response systems and automatic number identification systems. Although impulse pay-per-view (IPPV) has grown, it has not become the primary method of PPV order-entry.

Conventional order-entry methods have not impeded PPV buy rates significantly. Furthermore, as long as PPV events remain only on a few channels with less than desirable release windows, conventional order-entry methods are likely continue to be sufficient for PPV ordering.

However, the industry has a vision of the future that includes the ability to have hundreds of channels that would allow more selection of PPV programming. And, the industry is betting that more selection of PPV programming will add significantly to revenue growth. To provide more selection of PPV programming we must first gain more bandwidth. Two basic methods exist to acquire this bandwidth; first is to upgrade the distribution system with fiber and add as many analog channels as needed. Second is to implement digital technology, when available, and compress video channels. This method also will require some bandwidth extension but not as much as an all-analog system.

Assuming systems will build sufficient bandwidth to add many PPV channels, the next question is how we present the programming to the subscriber in a manner to increase buy rates. One method is to use the movie-on-demand (MOD) concept. This article will describe one way that MOD may be implemented to provide more PPV programming with a more friendly method of delivery.

Figure 1: Appearance of movie-on-demand, almost



The home video store

MOD (which was coined by the cable industry) is basically a video store in the home with more convenience. The goal is to provide any movie available when the subscriber desires it. (Practically, this is not possible for reasons that will be apparent later in the discussion of near-MOD.) The service should have first and second run movies packaged along with old classics. The important thing will be to have a large selection of movie titles available to the home if MOD is to be successful.

Cable and, potentially, its competitors are poised to provide MOD. The only things holding them back are primarily financial and technical. The technology will be here in the next year or so, which leaves the cost of paying for this new technology as the remaining financial hurdle.

The technology must provide subscriber convenience if MOD is to be successful. The subscriber must be made aware of what's available, when it's available and how to order the movie. The technology needed clearly suggests a home terminal with the ability to list all movies available. This list may be on a barker channel, but the more likely scenario is a home terminal with on-screen display that can display an electronic program guide. The movie list should include times of showings although the majority of buys should be on impulse and the movie should begin almost immediately. And last, the subscriber must be informed of the buy procedure. The buy procedure needs to be simple to follow, easily accessible and integrated with normal viewing habits.

It may not be apparent why the industry is willing to invest in a MOD PPV service since the existing PPV business has not been an overwhelming success. One reason is that while cable industry revenues continue to grow, they are not growing as fast as they used to. By deploying an MOD service, the cable industry hopes to increase revenues through a PPV service designed to get higher subscriber participation. If we gain higher subscriber participation, then the cable industry will earn increased revenues.

Another reason the industry wants to enter the MOD business is because it represents a significant opportunity for the cable operator to gain a piece of the videotape rental business. For 1992, videotape rental and sales revenue was over $11 billion. Over the same period, PPV revenues represented $390 million or less than 4% of total video rental and sales revenues. Clearly, there is room for the cable industry to eat away at some of the video stores' revenue if it

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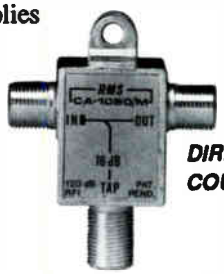

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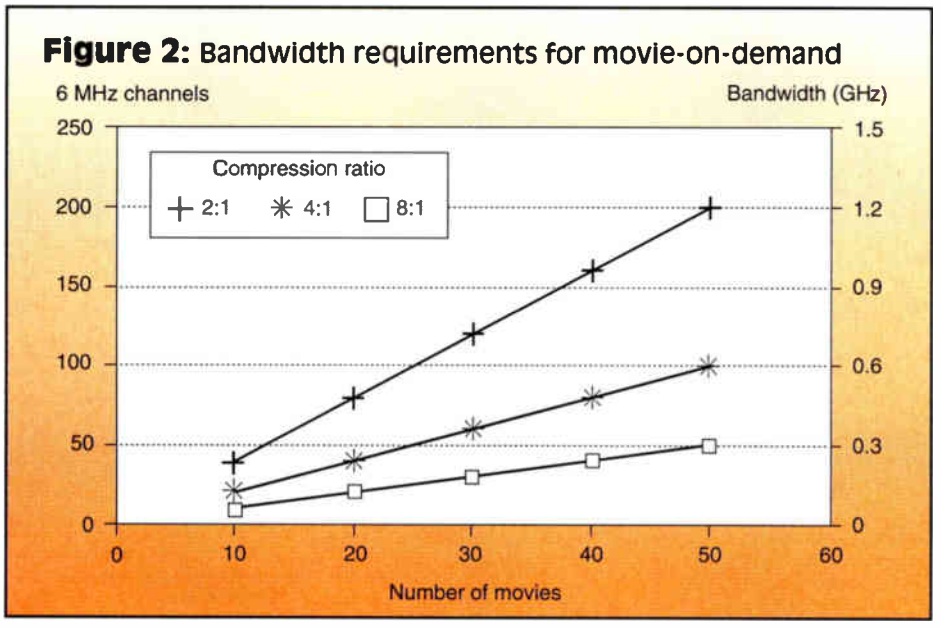
Figure 2: Bandwidth requirements for movie-on-demand



can offer a product that more effectively competes with them.

Much confusion exists as to the best way to deliver MOD. Several technologies are being considered. The industry has spent much time and energy evaluating these technologies. Mentioned here are only two. One technology is switched video-on-demand (VOD) in which a subscriber may order a movie at any time and have control over that movie. The second technology involves a multiple repeat of the same movie with delayed starts, often called near-MOD or -VOD.

Switched VOD

Switched VOD technology allows subscribers to order any movie available at any time. In addition, they can pause, rewind and fast forward the movie. In a switched VOD system, however, the total number of movies that can be delivered simultaneously is limited by the size of the switch, the storage device and the design of the system architecture. The theory behind a switched video system is that the switch is designed to provide, in this case, a MOD service to a percentage of the total subscriber base. This theory is based on the fact that all subscribers will not be watching a movie at the same time. If more subscribers order movies than the switch can provide, then the switch will block any additional orders and those subscribers will not get their movie.

The switched video concept is used as an outgrowth of the way the telephone system works. If the phone

"The key (to MOD) is to provide a service that more closely resembles the selection and convenience of a video store if the industry is to compete ... and grow its PPV revenues."

system is overloaded, it will give you either a reorder tone or "all circuits are busy" message. Switched video will be possible some day with availability of high density digital storage of video and a switched video architecture. However, cable systems are not currently designed with a switched video architecture and it will be some time until they are. As a result, we need to evaluate other alternatives for providing VOD with our current architectures.

Near-MOD

One method receiving much attention is near-MOD. It is a technology that will allow the industry to deploy VOD long before a switched video system is available. The trick with near-MOD is to make it appear as close to "on-demand" as possible. By utilizing a multiple play, delayed or staggered start technique, MOD will appear as though a new movie begins, for example, every 15 minutes. And if the subscriber needs to pause or stop the movie, he or she can continue watching the movie where it left off or at an earlier point with the next movie. See Figure 1 on page 24.

To accomplish the multiplay, delayed start MOD service, a very intelligent home terminal is required. It must have the capability of determining which channel to tune at the start of a movie or at any restart point. In addition, the terminal must perform these functions transparent to the subscriber.

The example shown in Figure 1 requires eight channels for a single 2-hour movie using a 15-minute delayed start. The delayed start can be increased to reduce the number of channels needed for one MOD. However, overall buy rates may be lower. Subscribers may not tolerate a longer wait and may decide to go to the video store instead. Therefore, it is important keep the delay times short to make the service attractive to subscribers.

Bandwidth requirements

If eight channels are needed to effectively deliver each 2-hour movie every 15 minutes, the need for bandwidth is tremendous. For example, if you want to provide a modest 20 movies on-demand, you would need 160 channels of analog video. At this point, bandwidth of the system becomes the limiting factor for the number of movies on-demand you can provide. Even in an analog system built for 1 GHz the maximum number of channels achievable is only 150. This number is obviously not sufficient for even a limited MOD service.

As a result, digital technology with compression is imperative if MOD is to be a viable service competing with the video store. Compression ratios of a minimum of 4:1 are necessary to provide any reasonable quantity of movies on-demand. And, ratios of 8:1 will allow MOD to be more effective. The operator must balance the number of movies carried with the bandwidth and compression technology available. Figure 2 illustrates the bandwidth and compression ratios for different quantities of movies. For example, only 300 MHz is required for 50 movies starting every 15 minutes using an 8:1 compression ratio. If compared with an analog system, for the same number of movies, it would require 2 GHz of bandwidth.

The larger the number of MOD

(Continued on page 50)

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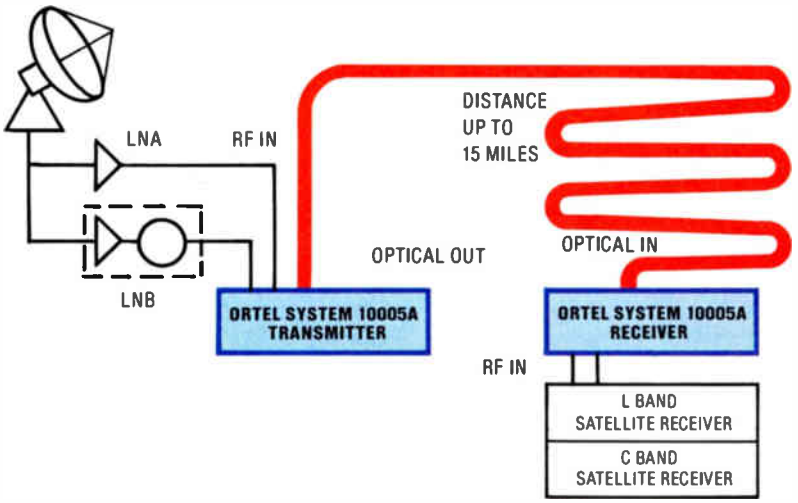

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Reader Service Number 38

Cable TV in the consumer home

By Daniel Moloney
Director, Subscriber Product Marketing
Jerrold-General Instrument

Cable TV has always been a mainstay of the home entertainment environment. Cable started as the only method by which subscribers in remote areas could receive the latest innovation in home entertainment — television. Its popularity blossomed when satellite transmission gave cable yet more programming options, including uncut movies, music videos, all-news, all-weather and all-sports networks.

Suddenly only cable subscribers were receiving the most talked-about programming. Cable moved from a rural delivery system to an entertainment option for suburban, and finally, even urban dwellers. Today, more than 60% of America's TV households are connected with coaxial cable, and the number keeps going up all the time. Cable has become as much a part of the home entertainment center as the VCR, compact disc player and stereo receiver. It is another hi-tech component offering enhanced services to the user.

Starting next year, a number of major cable operators will begin to offer digitally compressed cable signals to their subscribers — expanding the programming possibilities to literally hundreds of choices and further solidifying cable as an essential ingredient in the subscriber home.

This article will look at some of the reasons cable TV has become so important to subscribers and some of the things the cable industry can, and is, doing to make certain that cable is a required element in those homes.

Digital compression

Who would have believed, only two years ago, that nearly every major cable operator would begin to offer digitally compressed signals to subscribers in 1994? The rapid development and acceptance of digital TV has surpassed even the bluest sky predictions of just a few years ago.

In fact, digital compression has come on the scene so quickly that the technology has preceded the programming applications. The only viable option — near video-on-demand (NVOD) — is what will drive the initial implementation of the service while programmers scramble to fill up the "500 channels" that digital compression will present.

Digital compression for NVOD applications is attractive because the compression process is most efficient when used on film-source material where it can achieve a 10:1 compression ratio. While the digital compression encoder remains relatively expensive, national delivery of NVOD applications maximize its use.

Another consumer-friendly feature of digital compression is that the digital transmission of the signal is typically more robust than the analog signal. A digitally received signal is of the same high quality at reception as it was at transmission because it does not degrade en route. The digital signal also includes a digital audio signal to enhance the audio in conjunction with high-quality sound.

Digital audio

Another home entertainment option also is the result of the digital age. Cable subscribers typically have compact disc players in their home entertainment centers. They have, since the mid-1980s, become accustomed to the high-quality, crystal clear sound of digital audio.

The standard stereo receiver, with FM signals, is therefore disappointing. No matter how clearly these signals are transmitted — and in many remote areas reception of FM is a distinct problem — they cannot match the depth and breadth of digital transmission.

Cable offers a solution to this problem, and a welcome addition to the home entertainment center, with digital audio. Cable is doing with radio what it did with television: revolutionizing the means by which people receive it by improving quality, widening programming options, narrowing formats and delivering it to the home via the same cable.

Today's digital audio services are giving subscribers a very valuable addition to their home entertainment centers with multiple channels of CD-quality audio, including simulcasts of the most popular cable networks. Not surprisingly, this enhanced audio also is perceived as improving the entire cable TV package. Focus groups have repeatedly shown that viewers perceive improved picture quality when the audio is substantially improved.

On-screen graphics

The cable TV converter, even without compression, has transformed in the last five years. It is not really fair to call this intricate piece of technology a channel converter — or a tuner — because it does so much more.

Today's typical analog addressable cable converter, in addition to authorizing channels and services, gives subscribers consumer features such as last-channel recall, favorite-channel programming, remote volume control and parental lockout control. Using the converter and a remote control, subscribers can order pay-per-view events at the touch of a button and have them show up instantly. And, using the converter, subscribers can time-shift VCR recordings.

Another important part of today's addressable converter is its on-screen graphics. This subscriber-friendly feature walks subscribers through the most important parts of converter operation and options. For operators, they offer a graphics doorway to directly communicate with an individual or groups of subscribers.

Telephony

Cable TV is an ideal way to deliver audio and video entertainment options to the subscriber home. With the deeper and deeper penetration of fiber optics into cable systems and digital delivery, the channel and programming selection is almost limitless.

Not to be forgotten, though, is the fact that cable offers a return path to the operator's office — a way for subscribers to talk back. Many of today's addressable converters are equipped with internal modems to send information back to the cable system computers, either via the RF stream in two-way systems or over the telephone line in one-way addressable operations. Right now, these modems generally forward impulse store-and-forward pay-per-view orders to the system headend. These same modems, however, could be the base for the next breakthrough in cable TV home electronics: telephony.

(Continued on page 62)

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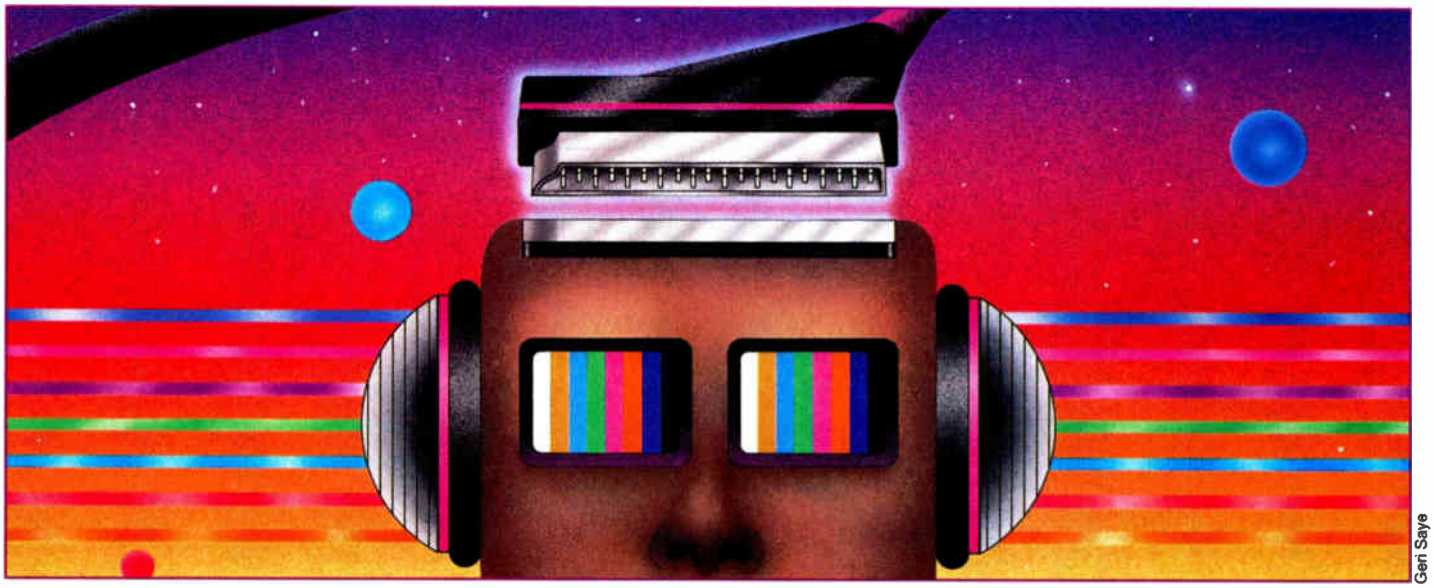


Geri Saye

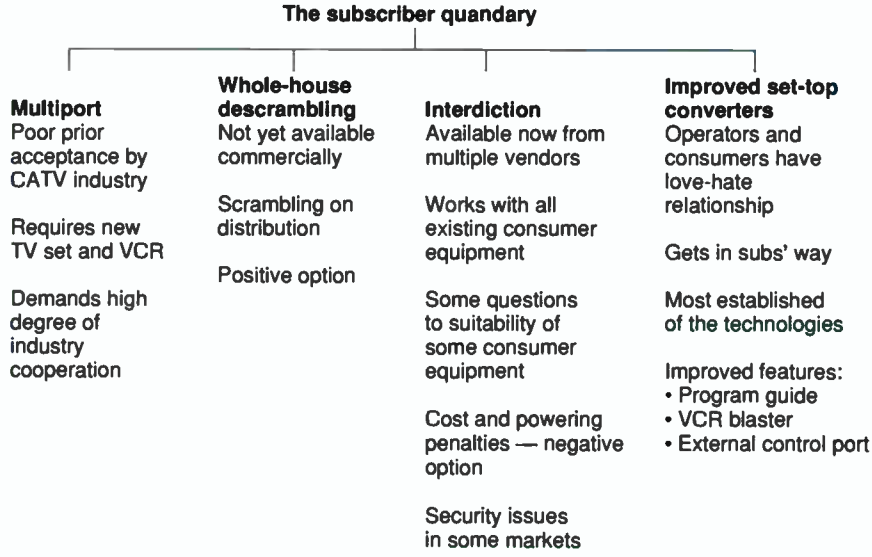
Subscriber-ready cable?

By James O. Farmer
Vice President, Electronic System Products Inc.

In the years I have been in the cable TV industry, I have seen many wondrous things. But never the type of quandary faced by the industry today as it seeks to define its interface with the consumer in the 21st century. Yet no issue is more germane to your future than how you interface to your subscribers. That interface, whether it be a cable box or some other less visible thing, is what you are to your customer.

We'll review several approaches being studied today for serving the subscriber, finishing with a somewhat verbose description of the new generation of set-top converters that will enter the market in the next few months. Figure 1 shows some of the possibilities — though it really is not this simple.

Figure 1: Some options for the future



The multiport

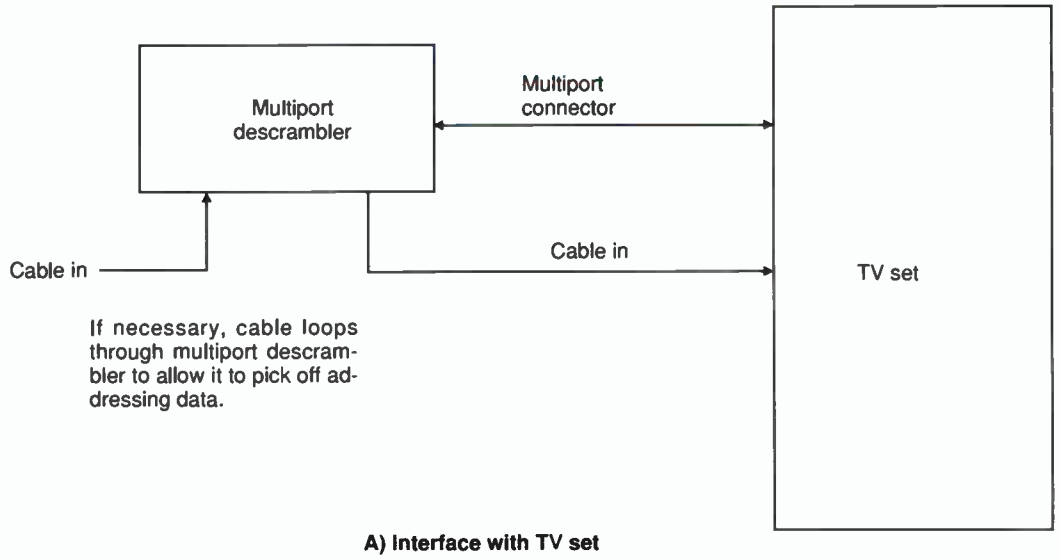
A few years ago cable equipment manufacturers and consumer electronics manufacturers did something novel: they sat down and talked to each other. The topic of conversation was (and 10 years later, still is) the difficulty of interfacing the world of the consumer to cable. A solution that came out of this was the multiport,[1] a connector on the back of the TV set that could interface with a descrambler provided by cable industry manufacturers.

The idea was sometimes called a "set-back converter" because it could be located behind the TV set, out of sight. It simply monitored the video (and audio if necessary) of the tuned channel. The TV set passed to it the output of the video and audio detectors in the set. If the channel was not scrambled, the multiport box did nothing. If the signal was scrambled the box checked to see if it was legal to descramble it. If not, the box blocked the video. If it was legal, the box did the descrambling and passed the signal back to the TV set.

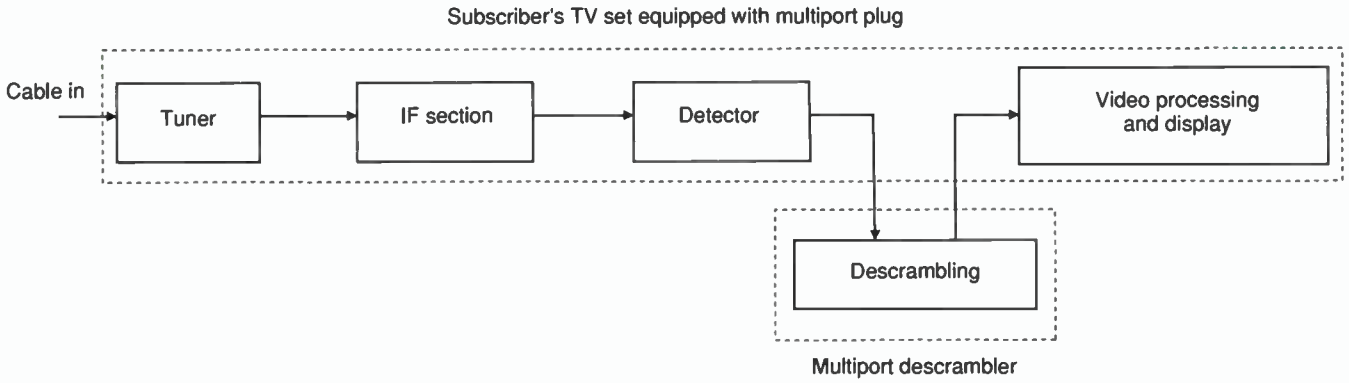
Figure 2 shows the basic idea of the multiport system. Figure 2A shows the multiport descrambler attached to a TV set. If necessary to pick up data for addressable control, the incoming cable can be passed to the multiport descrambler before the signals are supplied to the set.

Figure 2B shows the block diagram of the TV set and multiport descrambler. The set tunes the channel, passing the scrambled signal through the IF and detector as if it were a normal non-scrambled signal. From the detector the signal is passed to the multiport descrambler, where it is descrambled. The descrambled signal is passed back to the TV set for baseband processing and display. Even though the descrambling is done solely at base-

Figure 2: Multiport descrambler



A) Interface with TV set



B) Block diagram of interface

band, the multiport can be compatible with the majority of RF scrambling systems in use today, as well as baseband descrambling. Doing sync suppression descrambling at baseband when the scrambling was done at RF is somewhat more complex, but it can be done.

Multiport didn't catch on, despite yeoman efforts on the part of certain leaders in both the consumer and cable industries. One well-known TV manufacturer put the multiport connector on a large number of high-end sets for two years, and several manufacturers put it on selected sets. A few descramblers were purchased, but the reception by the cable industry was less than enthusiastic. One of the problems was that in order to take advantage of the multiport, one had to buy a new TV set and, preferably, a new VCR.[2]

Another problem that caused some operators to reject the multiport was that it did away with remote rental revenues, perhaps a fait accompli now, thanks to the new cable bill. Also, some operators may not have been willing to work through the economic implications: the manufacturing community estimated the ultimate cost of a multiport box to be about 60% of that of an addressable set-top converter. Compared with a set-top converter, the multiport descrambler does not have to contain a tuner and demodulator, nor does it need a remote control or channel display. However, the cost estimate was based on comparable volumes. Because the initial volumes were so low, manufacturers priced the boxes similar to addressable converters. At that, they arguably were losing money. The negative reaction by operators discouraged manufacturers from supporting the product.

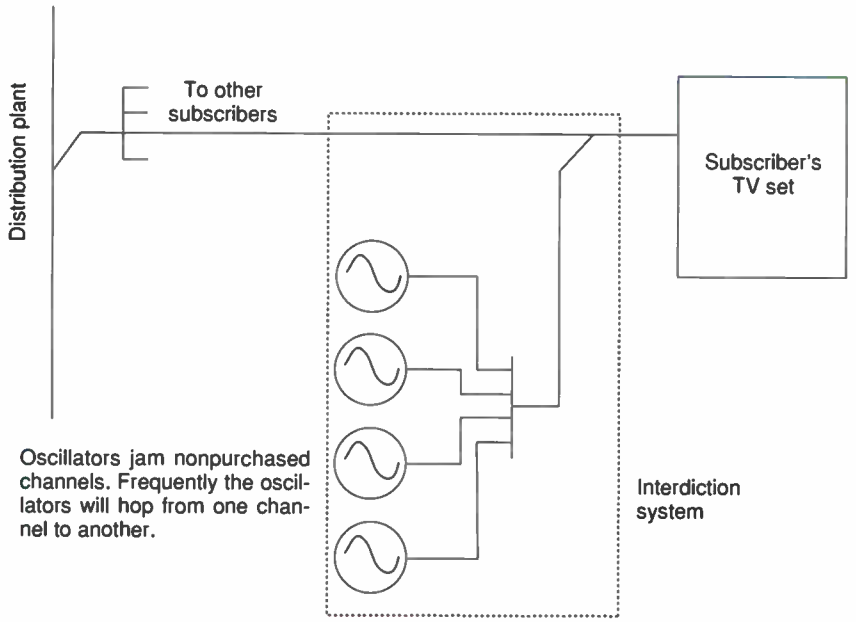
Because of these reasons and more, the multiport as it was designed is pretty well dead now. The sentiment is to not try another such standard unless the management side of both the cable TV and consumer electronics industries have agreed to develop something, and agree as to what that something will do. In retrospect, it may be that lack of management "buy-in" to the engineering solution may have been the root cause of the lack of acceptance.

There is talk of a "son of multiport" as part of the HDTV standard, and a committee is working on such a definition. (Presently there is little support from the operating community, a circumstance that begs for rectification.)

Whole-house descrambling

This is a new concept not yet pub-

Figure 3: Interdiction principle



licly revealed, in which a descrambler at the entrance to the home recovers all of the scrambled programs authorized, passing them and the nonscrambled signals to the subscriber. In many ways this seems like the best of all possible worlds. Signals are scrambled on the distribution plant, minimizing the risk in cases where that plant cannot be secured. The signals are presented in the clear to the subscriber, who doesn't need any equipment in the house. (We presume that provision can be made for a small IPPV box if needed.) Equipment is placed only at houses that are taking premium services, minimizing cost compared with some other alternatives.

The system is said to work with any existing sync suppression technique, giving rise to questions about the security level. According to the little information available publicly, the scrambled channels must be gen-locked together. (That is, syncs must occur simultaneously on all scrambled channels.) Also, costs and reliability are not known yet. Time will tell if this is a workable solution.

A variation, which should go either under whole-house descrambling or set-top converters, is a single fixed-channel descrambler introduced last year by one manufacturer. It is used for the house that has only one premium subscription (the rule rather than the exception). The descrambler continuously descrambles that channel, putting out the descrambled signal on a reasonably clear channel. It looks to the subscribers much as if they have access to the signal the same as if either whole-house descrambling or interdiction were being used. The exception is that the sub would tune to UHF Ch. 14 (for example), which may or may not be convenient depending on the TV set.

Interdiction

This idea has been around in one form or another for quite a few years now. Interdiction systems are available from several manufacturers. While interdiction is in use, the technology has not enjoyed widespread deployment despite some excellent subscriber advantages.

Interdiction systems work by transmitting all signals in the clear from the headend. The subscriber tap is replaced with the interdiction hardware, which generates interference on those premium channels not purchased. The system is truly transparent to the legal signals: no scrambling and descrambling is done, so there is not that possibility of signal degradation. Subscribers receive a complete spectrum of the signals to which they are entitled, in the clear.

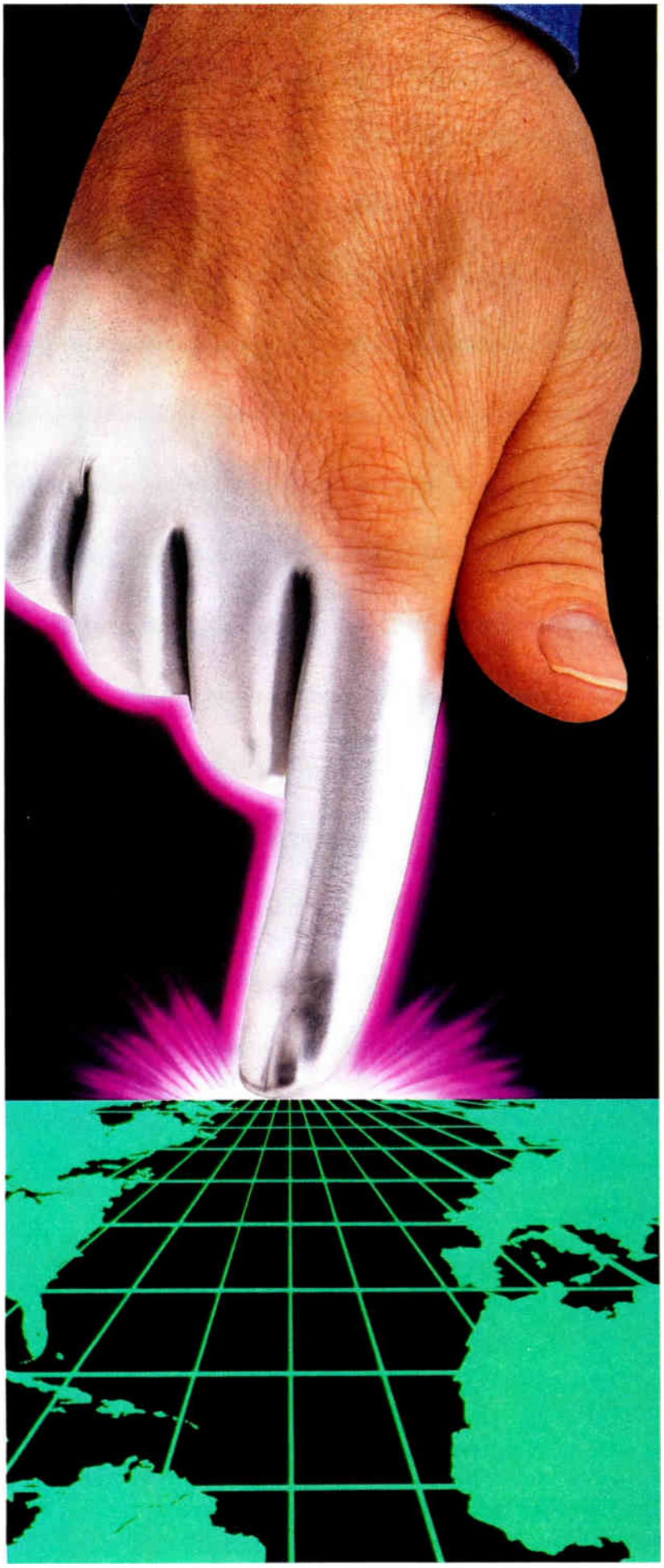
Figure 3 shows the basic idea of an interdiction system. The tap on the distribution system supplies signals to the interdiction equipment, which may or may not be an integral part of that tap. Oscillators in the interdiction hardware jam those channels not purchased by the subscriber. Frequently the oscillators are shared among several channels. It may be shown that excellent jamming is usually obtained when the oscillator is used to jam up to four channels, and more channels may be jammed at some reduced level of picture obfuscation. Some manufacturers, though, prefer to dedicate an oscillator to jam the most critical signals.

As with whole-house descrambling, interdiction is imminently friendly to consumers, who can watch and record as they please, retaining all of the advantages of their equipment. Studies of systems that are using interdiction strongly suggest that, because of the friendliness of the system, the pay-to-basic ratio, and even basic penetration, are enhanced by interdiction.

Nevertheless, interdiction has remained a niche market.[3] Several reasons appear to exist. The equipment must be installed for all subscribers, even those who take only the most basic tier of service. This raises costs compared with converters. Some studies have suggested that increases in revenue for more pay units, more basic subscribers and more additional outlets, more than offset the cost. This is not universally accepted, however.

Since not all subscribers have "cable-ready" TV sets that tune all desired channels, it is necessary for the cable company to supply some percentage of homes with a basic converter. We don't know if anyone has considered the practicality of letting the subscriber pay for the converter. Of course, the arguments about loss of remote revenue still apply, as do the arguments that remote revenue may be going away.

Systems sold in the past have been powered from the distribution plant. Indeed, there are good reasons that home powering is difficult for pole-mounted equipment. The power needed and the limitations on open circuit voltage due to Underwriters Laboratories' rules, make AC home powering impossible — the IR drop on a long drop cable doesn't leave enough power for the equipment. DC powering is not favored due to electrolytic corrosion of the mechanical joints in the drop cable, though it is being tried. A new system has proposed to eliminate these restrictions, but it has not been field tested thus far. The need for system power has discouraged some from committing to this technique due



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Security is excellent with interdiction: a carrier is injected very close to the picture carrier frequency, and a number of other tricks are utilized to render recovery of a good signal much more difficult than with practical scrambling systems. Usually audio is scrambled, though it is possible to recover it with effort. A minor problem that we have not heard from the field, could be that when the subscriber tunes to a non-authorized channel, a loud noise will be heard. In cases where the distribution plant cannot be physically checked for unauthorized taps, interdiction does have something of a disadvantage. Since the signals are not secured on the distribution plant, someone illegally tapping the plant will get the premiums as well as basic service.

Both interdiction and whole-house descramblers have the possible limitation that they must work with consumer sets, not all of which are suitable for connection to cable systems. Problems include tuner overload from too many signals, image rejection and direct pick-up (DPU). This latter problem is the worst: some sets tend to pick up a lot of signal from local broadcasters (and hams and business band radios) when connected to the cable. This problem has generated quite a bit of heat and perhaps a little light in the joint EIA/NCTA Engineering Committee. The TV people need solid statistics showing a problem that is worth solving. Bear in mind that the solution will in most cases require TV set manufacturers to spend more money producing sets, and the market has not allowed them to pass costs on to consumers in recent times. Also, DPU is not something that is a competitive advantage on the showroom floor. The TV set manufacturer has little incentive to do something about the problem. The cable industry through CableLabs and some good help from elsewhere is now working hard to come up with valid quantification of the problem.

Improved set-top converters

A few years ago I thought that the days of the converter were numbered. The product that the industry and consumers love to hate, has received a new lease on life, as a side effect (probably quite unintended) of the cable legislation that passed over the president's veto in late 1992. The legislation required that a very basic tier of service be offered at low cost. This has pushed operators to segregate many popular channels into a higher tier, which they must protect from those who buy the most basic tier.

"No issue is more germane to your future than how you interface to your subscribers. That interface ... is what you are to your customer."

Traps can be used in some cases, but this becomes awkward for many systems. At least one system announced that it will use interdiction to serve this need. Today another logical choice is further deployment of addressable converters, which can block all non-authorized channels, but only if they are scrambled. The possible forthcoming wider deployment of converters, and the emergence of other technologies, will cause operators to again ask what business they are really in.

With the need to secure more signals in the future — and with the assumption that digital compression is just around the corner but will require converter boxes for the foreseeable future — attention is turning again to ways to make the converter attractive to consumers. Whether or not this will be successful will not be known for a few years.

Cable history 101

In order to appreciate the descriptions of what is coming in converters, it is useful to go back a few years and trace the history of converters and their appeal (or lack of same) to subscribers. Set-top converters were originally conceived of as a way of overcoming a problem that plagues the CATV industry to this day: DPU. Direct pick-up was enough of a headache in the early days to inspire operators to use converters that tuned nothing but the standard 12 channels, but that were shielded better than were TV tuners of the day. We suppose that the converter would have proven relatively popular with the consumer back then because it would be used when needed, to provide a demonstrably better picture.

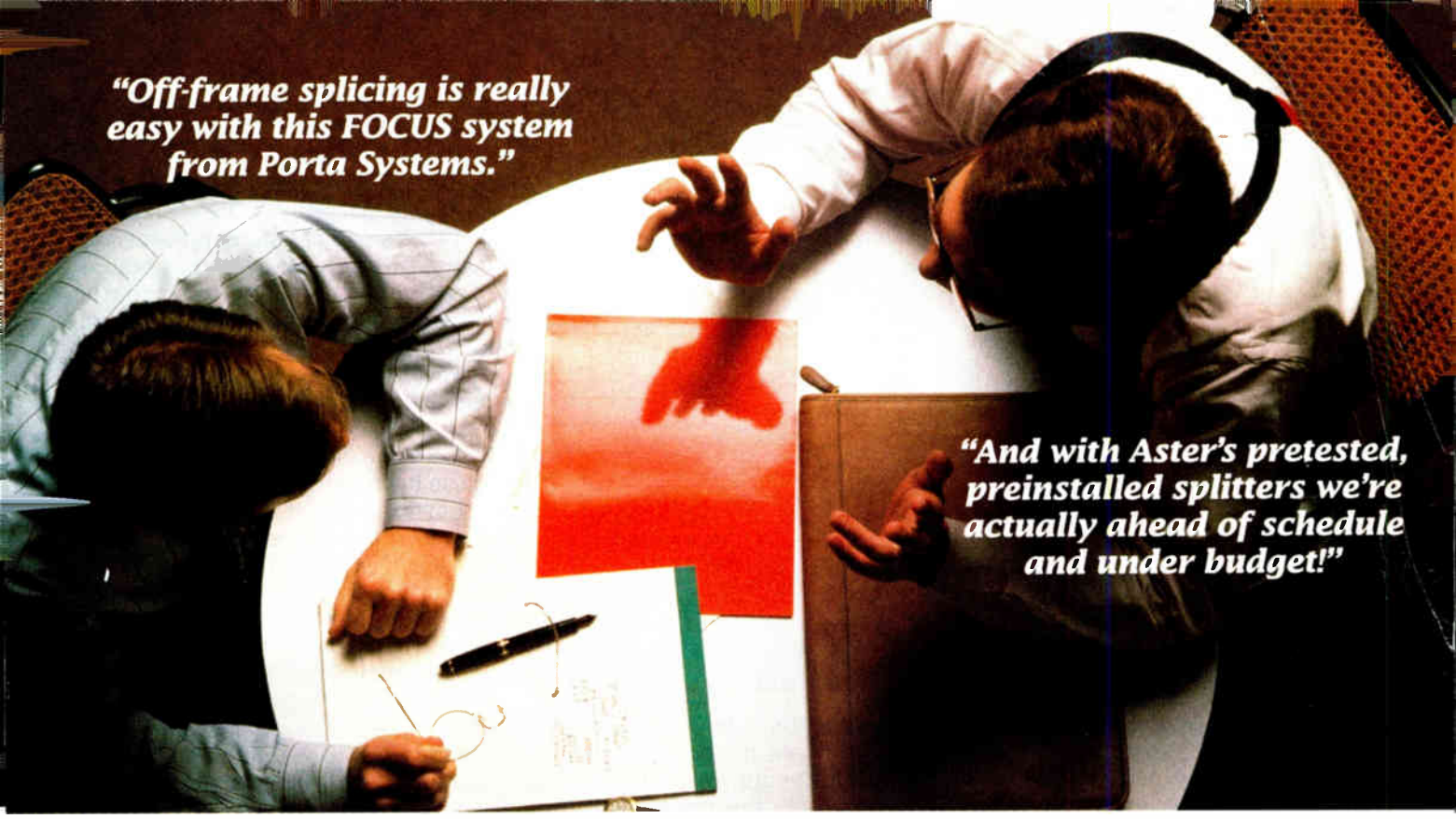
As cable systems added beyond the standard 12 VHF channels, using frequencies that couldn't be tuned by the TV set, the converter was expanded to include these added frequencies. This was seen as a real boon by the consumer, as "the box" opened the door for more entertainment than was available any other way.

Set-top converters began adding remote control before that was a popular feature on TV sets.[4] At this time, in the eyes of many consumers, the converter was a magic box that brought them more channels and made TV viewing more enjoyable by providing remote control. This brings us to perhaps the early to mid-1980s, when two things happened to diminish the positive feelings of consumers to the product.

By the early '80s TV set manufacturers had discovered cable and realized that they needed to produce a product that worked with cable. They added 75 Ω F-connector inputs and expanded tuning to cover the mid- and, later, superbands. The sets were advertised as cable-ready, and the sales people were trained to so sell them. It was when buyers got the sets home, that the magic box started to lose its spell, and the consumer and cable industries started to get into real trouble. To begin with, the TV sets didn't use the same channel designations as did the cable operators, and different sets defined channels differently. Thus, a consumer who was accustomed to finding a favorite channel on Ch. A, might now find it on Ch. 14 (but not to be confused with UHF Ch. 14 — try explaining that one to your grandmother), or some other channel, and not on the one on which his neighbor found it.[5]

A second problem was that, while the tuner could pick up at least some of the CATV channels and had an F-connector, it didn't handle well the large number of signals on the cable system. It overloaded easily, producing beats, and the image rejection was insufficient in some cases.

Further, the tuners were not shielded well enough to avoid DPU, and the subscribers sometimes found them-



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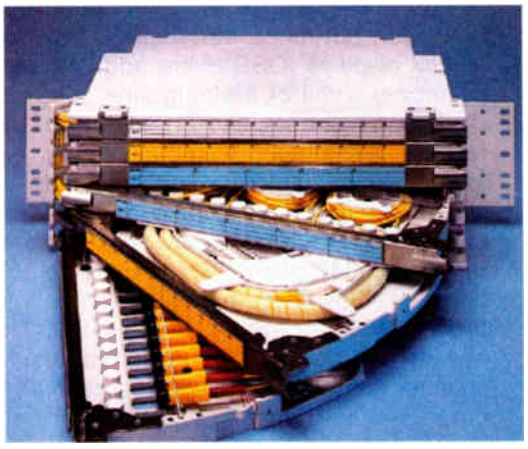

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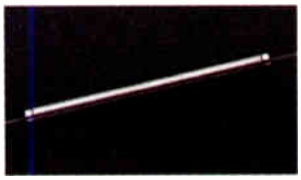

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Reader Service Number 41

The telcos are coming

By George Lawton

Watch out cable, the telcos are coming. In the past, it seemed like they would never be able to compete in cable's arena without completely rebuilding their infrastructure with a high bandwidth fiber-based network. But new technology on the horizon could enable them to support VHS-like quality video on their switched network with a minimal investment in infrastructure. The only barriers remaining are legal — and those are fast beginning to crumble.

Bell Atlantic, Southwestern Bell, GTE and US West are all beginning to dip their fingers into video in this country and abroad. The local exchange carriers (LECs) in the U.S. had annual revenues last year of about $90 billion according to the Federal Communications Commission — several times that of the entire cable TV industry.

But they may be getting restless. They are finding their most profitable markets are shrinking as competitive access providers like Metropolitan Fiber Systems and Teleport begin to lure away their customers. Video services could enable them to regain those lost revenues — with interest.

Pushing the envelope

Bell Atlantic is probably the most aggressive telco in pushing the envelope of video technology. It is already in the development stages of two full blown networks in New Jersey and is beginning market tests in northern Virginia. As Larry Plumb, a spokesman for Bell Atlantic, said, "We are absolutely serious about getting into the video business. The endpoint we are after is two-way broadband interactive services. It will be in fashion as early as 1994 and we will have heavy deployment in 1995 to 1996."

Last October, Bell Atlantic announced a technical test of asynchronous digital subscriber line (ADSL) this summer in northern Virginia through its subsidiary, Chesapeake & Potomac Telephone. ADSL is basically a high-speed modem. It enables the telcos to send 1.5 Mbps up to 3 miles in one direction with no new equipment in between. This will enable the average central office to offer video services to consumers by adding one ADSL modem in the central office and another in the customer's premises.

Initially, only 400 customers will be served in the test, which could last up to two years. Plumb anticipates that if all goes well full commercial deployment will begin in 1994. The cost of this technology, along with the video servers required to store it, could drop to under $500 a customer in the near future, according to one Bell Atlantic technician.

In the trial, Bell Atlantic will use video servers to store movies and other video that can be watched by consumers in real time. The server could be as simple as a 486 IBM PC with a large disk drive.

The video is compressed via MPEG, which Plumb claims enables a 1.2 gigabyte disk drive to store 30 full-length movies. Multiple consumers could simultaneously watch the same or different movies without affecting one another. They could even pause the movie and instantly jump forward or backwards by a fixed amount without affecting other viewers.

"New technology on the horizon could enable (telcos) to support VHS-like quality video on their switched network with a minimal investment in infrastructure."

According to industry analyst Gary Kim, 70% of all video rentals would be the top 20 movies if they were always on the shelf. ADSL could enable the telcos to take this cut off of what Kim claims is a $20 billion market.

The services would not have to stop at movies either. Virtually any source of video could be stored and watched at a later moment. Plumb said, "This will let me watch *60 Minutes* on Monday morning while I am eating my corn flakes."

Plumb believes that ADSL will give the telcos first strike capabilities with the next generation of video-on-demand (VOD) services. They will not have to build an entirely new infrastructure to begin luring customers into their service.

Instead, they can begin marketing ADSL-based services across a wide metropolitan area. They would only have to install the equipment on the lines of those customers requesting service. When the demand in a particular area is significant, they can then move to a more advanced network based on fiber-to-the-curb, or even the home. They will be economically justified in doing so, because the market is already developed. "We can build video-on-demand to reach critical mass and then take the modems to another market," said Plumb.

This first test will remain relatively small. Bell Atlantic also is developing large scale video services as well. Last November, it announced that it was developing a video network in Morris County, NJ, that will serve 8,000 subscribers through its subsidiary, New Jersey Bell.

The initial network will be broadcast-based like cable TV networks of today and will support 64 channels of video. But these channels could be targeted at specific markets as small as 500 homes.

Cable's new network?

Dallas-based Sammons Communications, the incumbent cable TV franchise in the Morris County area, will become the programmer for the network. It will drop its existing network and move into the business of providing content. Ed Comstock, vice president of operations at Sammons, had been looking at rebuilding the network in the near future. Comstock said they were unsure if there would be any cost savings. "The financial picture is a little difficult to analyze in the sense that you are trading capital costs in plant investment for monthly use expense."

It could lead to efficiencies in plant maintenance. Only one set of service engineers will be required to handle both video and phone networks. New Jersey Bell will own and maintain the plant and lease space to Sammons. Sammons will have no plant maintenance and no indirect cost related

to it. Comstock said that this will result in the loss of some depreciation advantages.

"Initially we want to get the system up and operating," said Comstock. "In the meantime we will be looking at different programming and information services." He sees the big service potential in switched VOD.

Sammons will have access to 60 channels vs. the 37 it has currently. Although they will not be compressed at this time, they could be in the future because digital terminals in the home will be used to convert the signal into video. Sammons will still have over 80,000 other subs not on the system in the same area.

Last December, New Jersey Bell announced it would be building an even larger network in Toms River, NJ, that would be able to handle 38,000 homes. New Jersey Bell will act as a service provider, while another company, FutureVision of America, will provide the programming.

Under the 10-year agreement with New Jersey Bell, FutureVision will be able to transmit video to homes and businesses in Toms River. New Jersey Bell will begin modernizing the network this summer with equipment from Broadband Technologies Inc. of Research Triangle Park, NC.

Fiber will be pulled to curbside locations near each customer's home. Initially the network will provide 64 channels to each curbside pedestal, which could be programmed independently of other pedestals. In the future the network will support VOD services enabling customers to dial up almost any source of video.

"FutureVision will be able to provide customized programming to specific neighborhoods, and we will be working with local residents to develop appropriate packages based on this capability," said Bob Schena, president of FutureVision. "Initially we will have 123 channels of video programming from which we can choose as we develop these customized packages. Using New Jersey Bell's network, we will be able to deliver a customized mix of 60 channels to a given neighborhood."

FutureVision was recently founded by Schena to take advantage of the opportunity created by New Jersey Bell. It is positioning itself as an education and entertainment provider and will provide services that enable consumers to send as well as receive information.

Bell Atlantic is not alone in moving to support cable companies through its network. New York Telephone announced last February that it would conduct its first video dialtone trial starting in February. The test will use American Lightwave System's LiteAMp AM fiber transport equipment to deliver Liberty Cable's programming to more than 2,000 homes.

US West announced plans to build a broadband coax/fiber hybrid network within its territory that could eventually support VOD-like service. GTE has had an experimental fiber-to-the-home network in Cerritos, CA, for several years on an experimental basis to probe the market.

Incentive-based regulations could free capital

Part of the reason that Bell Atlantic is so active in New Jersey may lie the local government's relaxation of pricing regulations. Traditionally, telcos have been forced to establish costs predicated on a "rate based rate of return." That is, they were allowed to earn 10% on their total investment each year.

If telcos decided to get efficient and service more telephones at a lesser cost, their profits would drop. On the contrary, the more "required costs" they could justify for their

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phone service, the greater the profits they could reap in any given year.

Needless to say, this regulatory framework did not inspire cost reductions nor the desire to do more with less that prevails in competitive industries. It also did not enable New Jersey Bell to invest in other areas, like high capacity broadband networks. These were outside of what regulators saw as justifiable costs for their basic service networks.

Last year, New Jersey passed legislation that said telcos could propose new plans for the way in which services are delivered on the condition that the prices for basic phone service do not rise above a specific amount. This gave New Jersey Bell the incentive to find ways at increasing the efficiency of its network to improve its return on investment.

It also frees up the resources needed to build a broadband network. If this experiment in moving to incentive-based regulation succeeds, perhaps more states will adopt it as well. It will enable telcos across the country to begin funding the development of broadband networks needed to compete in the video services arena with cable TV.

Video programming still not allowed

The one thing holding Bell Atlantic back is that it is still prohibited from deciding upon the content of what is shown on its network because of Judge Harold Green's 1984 Modified Final Judgment (MFJ). For programming it must turn to independent companies like FutureVision or Sammons. Under the Video Dialtone Ruling announced by the FCC last July, telcos are only allowed to own a maximum 5% stake in any venture that provides program content through their network.

But Bell Atlantic, and presumably the others, want full control. "When a customer tells us they want to watch a certain movie or program on our network, we want to be able to secure it for them," said Plumb.

Bell Atlantic recently sued the federal government for the right to program the video on its network. It claimed that its freedom of speech was being violated, citing that the Supreme Court has ruled that video is a form of speech. Plumb said the cable companies use this argument all of the time when they fight regulations that stipulate they need to carry certain stations.

The trial is set for late May. If successful it will give the telcos a greater freedom in the deployment of video services to the home.

Telephone companies may try other tactics to break the limits of the MFJ. Last February, Rochester Telephone announced that it would open the local loop to full competition, in exchange for the right to get into other businesses, like cable TV and long distance carriage.

Rochester Telephone currently is serving 880,000 access lines throughout more than 15 states in the Northeast, Midwest and South. It is in the process of experimenting with video dialtone server technology developed by USA Video.

After Rochester Telephone's proposal, Ameritech followed with a similar proposal. In a filing with the FCC, the

"The telcos have, until recently, maintained a gentleman's agreement not to move into each other's territory. Now that agreement is over."

Chicago-based company proposed to open its monopoly in five Midwestern states to full competition. James Quello, acting chairman of the FCC, has already endorsed the plan. He called it a "big step in improving customer choice, strengthening the economy and providing good communication."

Moving into cable directly

The FCC's Video Dialtone ruling put limits on telcos getting into video services within their own territory. However, that leaves open vast expanses where they can get into video services outside of their area.

Recently, Southwestern Bell moved into Bell Atlantic territory with the acquisition of two cable TV networks owned by Hauser Communications: Montgomery Cablevision Ltd. in Montgomery County, MD, and Arlington Cable Partners in Arlington, VA. The two systems currently serve 228,00 subscribers and pass 390,000 homes.

The limitations on Southwestern Bell are relatively minor and probably will be overcome in the near future, predicted Bob Pepper, chief of plans and policy at the FCC. Southwestern Bell will need to get approval to transfer the permits as well as the microwave links under its control, but that is a matter of bureaucratic procedure.

Southwestern Bell also will need to get a waiver on the MFJ restrictions, which prohibits it from providing inter-LATA (local access transport area) traffic. The satellite dishes, needed to receive video channels from across the country, are technically inter-LATA, but others in similar situations have managed to skirt around this limitation. Also, Montgomery County happens to span two LATAs, making the provisioning of cable service there an inter-LATA affair. But here again, this limitation is likely to be waived in light of the circumstances. Southwestern Bell does not have a monopoly on the wire going into the homes in these areas — Bell Atlantic does.

Technically, they will have very different networks. Southwestern Bell will have coaxial cable capable of supporting tens of megabits of data, while Bell Atlantic will be able to squeeze a little over one — in a single direction. On the other hand, Bell Atlantic will have a switched network capable of connecting any subscriber to a virtually unlimited stream of voice or data. But when ATM comes around, it will level the playing field enabling both to offer the same services.

So now, these two companies will be head-to-head in competition. They both have extensive experience in installing phone systems, but only one would be legally capable of operating a video network on its own.

The inherent unfairness in this situation raised the ire of Congressman Edward Markey (D-MA), chairman of the House Committee on Telecommunications. Until last February, Markey was one of the greatest opponents to telco entry into video services. In light of the Southwestern Bell purchase, his mind may be changing.

In a letter to the FCC last February he said, "It is my view that in assessing the evolution of video programming in this country since 1984, the prohibition on local exchange companies provision of multichannel video services, in such instances where the local exchange company owned the content of the video programming, has served the public interest ... Recent development in technology and in the marketplace, however, paint a picture of converging industries in a way that necessitates reassessment of the policy structure governing both the cable and telephone industries."

Markey expressed concern that if cable companies could offer the same services as telcos, then the potential for competition becomes real. First Pacific Networks, based in Mountain View, CA, is developing a system that will enable cable companies to support phone service on top of their existing network. One representative claimed that cable companies could sell monthly phone service for only $5 per house — and still earn a profit.

The real advantage that telco competitors could have is that they can pick and choose the best customers. Meanwhile, the incumbent telco is required to provide universal service. This is how MCI managed to make inroads to AT&T over a decade ago, and how competitive access providers (CAPs) are undercutting the LECs today.

Markey continued, "At some point the technology and service become indistinguishable between various market participants, and at that point the question becomes whether the conditions and responsibilities for each market participant also should be indistinguishable." Toward this end, Markey ponders if perhaps Congress needs to redraw the line in how such

"One (First Pacific Networks) representative claimed that cable companies could sell monthly phone service for only $5 per house — and still earn a profit."

"burdens" as universal access are carried by the marketplace.

Markey was emphatic that telcos should be restricted from purchasing a cable company within their local area. This would wipe out potential competition from both sides. But he is uncertain whether the prohibitions on telcos owning programming should be re-examined. He noted, "The need for possible reassessment is heightened by the Southwestern Bell purchase because the multichannel competitors in the Washington, DC, suburbs will both be telephone companies."

Perhaps more significant than all the legal implications of the Southwestern Bell purchase lies in the new competition. The telcos have, until recently, maintained a gentleman's agreement not to move into each other's territory. Now that agreement is over.

Meanwhile the cable companies face one of the most intense battles their industry has ever experienced. One by one, the barriers holding the telcos back are withering away. Soon cable will face a competitor with greater experience in the communications business and greater capital backing. Perhaps the most powerful defense cable TV can raise will lie in cooperation. **CT**

Impulse PPV

(Continued from page 21)

tive. Second, the customer could have tampered with the converter, including blocking the reverse path. Qube systems have experienced this particular problem as customers bought "CB filters" at electronics stores, installed them on the input cable connection blocking the reverse path. Third, any one of the components in the reverse path such as reverse amplifiers could have failed. Or, the billing system may have the wrong data obstructing the polling process. Examples of wrong data are: the wrong bridger amp number, the wrong converter number, the wrong BCU number, etc. All of these problems cause a loss in revenue. There is, however, a way to deal with the issue of no-answer converters.

Working the no-answer report is a key task in the Cincinnati system and should be in any IPPV system. Among the tools needed are: lists of no-answer converters, radios to contact the reverse maintenance technicians, access to the billing system, etc. Standard troubleshooting techniques are employed to find and fix the problems. This is done one converter at a time. There are some things that can be done globally. One method of addressing the no-answer problem is to minimize the loss of revenue by telling the Qube converters to not authorize for IPPV unless they answer.

Cincinnati runs a SAP (subscriber authorization prohibited) program, which deauthorizes the box after 10 consecutive no-answer responses. In the real-time domain of Qube, 10 minutes will elapse and then the converter will no longer receive IPPV. Should a converter be on an IPPV channel and then become a no-answer for whatever reason, the converter also is deauthorized in 10 minutes.

Now let's look at how store-and-forward IPPV technology works and how it compares to Qube.

Store-and-forward, cable return

The dominant technology for IPPV today is two-way capable, store-and-forward (S&F). As the names suggests, a reverse path is needed. In some cases the phone system is the return path. In others, cable return is the choice. S&F is the name for the

converters' response to requests for IPPV authorizations and polling.

Today's S&F converters present a very customer-friendly way to choose IPPV. Generally, a menu system is used to walk the customer through the choices. The menus can be downloaded to the converter as can other types of locally generated messages. The customer selects a movie and then authorizes the converter. The authorization can be achieved by entering a PIN (personnel identification numbers), by pushing the "buy" button or some other means. At this point the event has been purchased. The converter stores the purchase in on-board memory. Total storage capability may vary from vendor to vendor. However, the number of storage slots usually exceeds the customer's needs. When the storage memory becomes filled, the customer will get an "authorization or access denied" style of message and will not be able to watch an event.

A control system, located at the office or headend, interfaces with the billing system. This control system instructs the converters and polls them for purchases. There are variations in both instruction and polling techniques. Some converter systems use a strictly out-of-band technique. Others use a strictly in-band technique where data is amplitude modulated on the FM aural carrier. And other converter systems use a hybrid of the two, putting high risk/high reward data on an out-of-band carrier and messaging data in-band on the aural carrier. Technically speaking, data could be inserted in the vertical interval as well.

One example of a hybrid approach is to transmit all converter service level and on/off commands (typical forward instructions) out-of-band,

"Reliability has been a constant problem for the Qube systems. Today's converters have a tremendous advantage over Qube."

while IPPV menus are downloaded to the converter as in-band data on any of the IPPV channels. Some converter systems ask all converters, even ones without purchases, to respond to the poll. Others "quick poll" in advance to find out which converters have purchases, and only these are polled on the next poll cycle. Still others tell the converters that have polls to send back the IPPV data without knowing which units have buys. This last method usually requires a special poll to find out which converters are answering because the control system doesn't use a handshake system. Within the different reverse polling systems, different transmission methods are used. Some systems use a dedicated reverse frequency for the converter while other systems use a shotgun approach by having the converter send the IPPV data back on four different reverse frequencies at four closely spaced intervals of time.

Because there is such a variation in technique, each converter system may have its own unique set of terms. Some vendors use different terms for different types of polls such as collections, sampling, quick polls, etc. Understand the terms' definitions. It is a must so that educated discussion can take place.

One important feature is polling speed. Higher speeds translate into more potential revenue. In order to increase polling speeds, the cable system is normally segmented into "collection lines." Collection lines are the combination of throughput devices that link the return path for the converters' IPPV responses to the control system. By having many links operating in parallel, more converters can be polled. In today's systems, the collection lines may be getting the reverse signal from different fiber nodes or combinations of fiber nodes creating some segmentation of the reverse plant. Again, the more collection lines, the faster the polling speed. Faster polling speeds mean that more polls can be taken, reducing the chance that any converter's purchase storage will be filled. Typical polling speeds a few years ago could have been in the 2,000 to 5,000 converters per hour range. Today, the speed may be as high as 35,000 to 50,000 per hour for full blown IPPV collection.

Once the converters are polled for the purchases, the control system uploads the data to the billing system so that bills can be generated. This uploading process is a completely different set of transactions that also need to be understood because this process can vary for different types of converter and billing systems.

So, as a process, events are stored in the converters and are forwarded by the converters via the return path to the controller. Even later, an upload transaction takes place when the controller sends the IPPV data to the billing system for inclusion onto the customers' accounts.

Operating with store-and-forward

Obviously, focus is still needed on making the return path as clean as

possible just as with Qube. However, the difference is that the reverse path for S&F no longer dictates whether an event can be purchased by the customer. The reverse path is now the focus for collecting these purchases and generating billing. Just as with Qube, there are no-answer converters. Some of the same problems with the plant will cause the control system to identify some converters as no-answer. Other problems experienced that cause no-answers have been the installation of VCRs upstream of the converter, the disconnection of cable jumpers on the back of the converter, the billing system data base having the converter off of the wrong collection line. Eventually, the no-answer will lead to an AD (authorization denied or access denied) problem, which was discussed earlier.

At this point, the big concerns about no-answers should be: 1) the customer's inability to purchase more IPPV because the storage memory has been filled without being collected, and 2) revenue is not being collected for those events. The customer getting an AD will generally call the office at the time that they're unable to access the IPPV event. And to get the problem resolved three things could take place. First, the CSR is able to determine that the customer has caused a problem and can walk the customer through a fix. Second, is to schedule a service call to resolve the problem, which is generally in the home. These two approaches assume that the converter is in the customer's home. This isn't necessarily the case because a global addressable system sends the same forward instructions to all areas. The converter could be in some other location, on a different collection line.

The third possibility is for the CSR to clear the converter's memory via a command on the billing system. This is not a very pleasant option because of the implication. Since the converter's memory holds the data for generating IPPV billing, any clearing of that memory wipes out the potential revenue represented by that data. The customer's most immediate problem is resolved — more events can now be purchased. But a new problem has just been created, loss of revenue. At this point, the real problem has not been resolved. The cause of

the no-answer and the subsequent AD has not been determined or repaired. The converter's memory will become full again, triggering another call from the customer. Some earlier versions of converters and control systems allow this to take place. Be careful.

The latest versions of converter systems get around the clearing of data by not allowing this to take place. Also, they've incorporated a way to get the data at a later time by storing the data in the converter in such a way that the IPPV data is linked to a customer. This is done by storing a customer ID with the event number at the time of event purchase. Even after a disconnect takes place, or a converter is removed from the home, unretrieved purchases can be retrieved at a later date and added to the customer's account.

Qube vs. store-and-forward

By far the S&F system is more simple in architecture than the Qube system because no bridger switching is needed. Creature features such as multiple-layered menus are non-existent on the Qube system. The menus for the S&F systems are very good and getting better. Qube has no menu system. The customer simply tunes to a IPPV channel and authorizes the event.

On the surface, Qube would appear to be a more simple converter design than the S&F converter because of the lack of sophistication and that very little memory is needed. Qube system personnel would probably disagree with this observation. Qube utilizes the converter status data in some very imaginative ways. S&F systems have techniques for providing converter status like Qube, but currently they are too slow or not developed enough to compare to the real-time capabilities of Qube. Some improvements may be on the horizon for better statusing capabilities for the S&F systems.

"When deciding on the right type of technology and vendor for your IPPV needs, don't be afraid to ask questions."

It's difficult to compare no-answer rates because of the outside factors. But, today's systems are not geared toward analyzing the no-answer problems. This isn't just a fault with the converter control systems. Generally, the billing systems should share the blame. Most of today's systems are capable of better no-answer reporting if the converter and billing vendors could agree on an integrated form of a no-answer report. The controller knows which converters don't answer. The billing system knows the addresses of these converters. The report should blend the two pieces of knowledge and issue reports on a user-defined basis. Few systems have a historical perspective to working no-answer reports, so those of us who do, know its importance. We should take a leadership role in defining and creating a set of no-answer report requirements in conjunction with the converter and billing vendors.

Polling speeds are much faster with Qube than the store-and-forward systems — 200,000 converters per minute vs. perhaps 50,000 per hour. A futuristic look at the concept of "metered service" might involve a look back at Qube, since by default Qube is identifying the program that is being viewed. One method of metered service would be that the customer pays based on what is watched, which is analogous to the providing of electric service. This could be on a per-channel, per-month basis. Or, metered service could be on a per-channel, per-minute basis. With some minor software modifications, Qube could perform a metered service data collection function. With the architectural advances of cable systems incorporating the design of smaller and smaller fiber nodes, a return to real-time data collection may be attainable and desirable for the introduction of metered service.

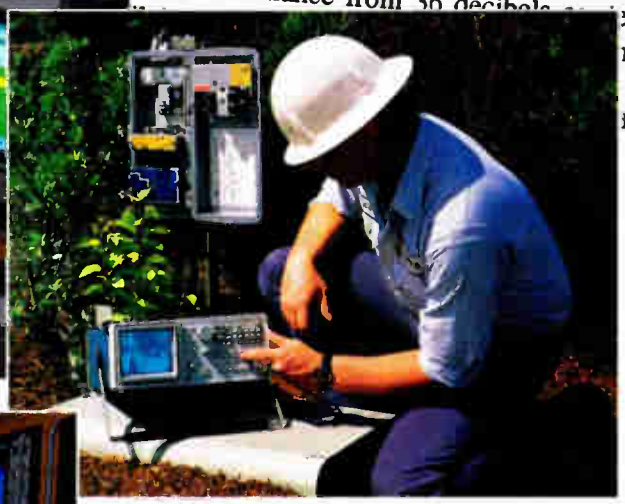
Reliability has been a constant problem for the Qube systems. Today's converters have a tremendous advantage over Qube.

Overall

Yesterday's system, Qube, is vastly different from the store-and-forward systems of today. The polling speeds are faster with Qube, but other factors suggest that S&F will be a major step up. In Cincinnati, we've learned from yesterday's Qube technology so that we'll be prepared when selecting and installing a S&F system. When deciding on the right type of technology and vendor for your IPPV needs, don't be afraid to ask questions. Be sure of the definitions. And make sure your personnel are properly trained for the technology advancement you are about to introduce. **CT**

The author would like to thank Mike Bertolino of the Cincinnati Division for his contributions on this article.

No problem!



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

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

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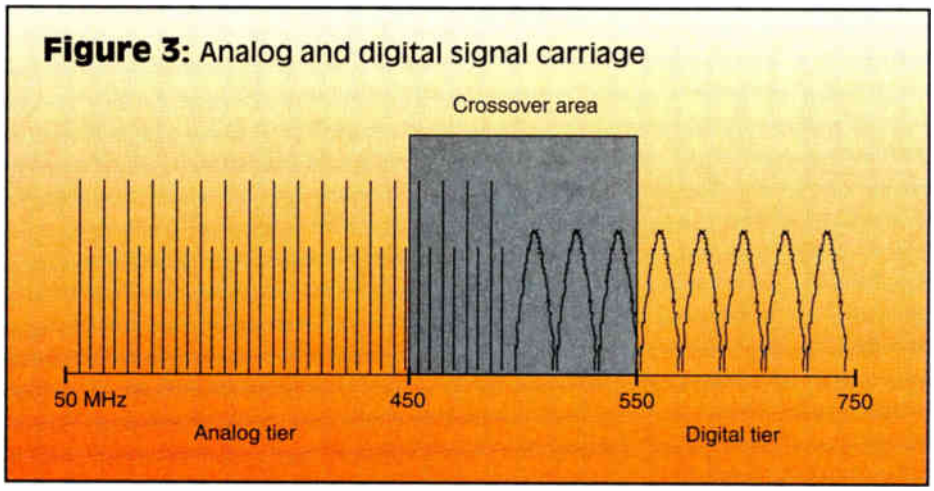
Figure 3: Analog and digital signal carriage



Movie-on-demand

(Continued from page 26)

channels the more competitive the service will be with the video store. Using the Figure 2 on page 26 as a basis for determining the compression ratio and bandwidth required, we can simply decide the number of movies to carry and the chart will tell us the bandwidth and compression ratio requirement. In order to compete most effectively with the video store, we need to provide as many channels of MOD as possible. However, even with 50 MOD channels the system needs 600 MHz at 4:1 compression and 300 MHz at 8:1 compression. The question becomes, how can we provide up to 600 MHz of MOD and still provide a standard analog service?

Preserve analog technology

It is apparent that MOD will require digital compression to be most effective, however, analog delivery must be preserved for some time because of the high number of analog devices in existence. If a system converted 100% to digital, it would require a digital terminal in every home. The cost estimate of digital terminals when they become available is between $200 and $300. This would indeed be an expense wasted on subscribers not desiring to subscribe to anything more than they have today.

Operating both an analog and digital tier makes economic sense as well. It allows analog services to be provided with a lower cost subscriber technology to subs only desiring basic cable services while MOD service can be provided utilizing the more expensive terminal to only those subs willing to pay for the premium service. Therefore, the system must be capable of operating both an analog and digital tier, at least for some time.

One way to operate both an analog and digital tier is to determine a crossover point in the band that provides sufficient analog channels but also maximizes the number of MOD channels. The challenge is determining the proper crossover point. Figure 3 demonstrates how an analog and digital tier might look in the subscriber's home.

The analog-to-digital crossover is between 450 and 550 MHz. Today, many systems have less than 450 MHz. However, every system being rebuilt or upgraded is at least 450 MHz or 550 MHz and some are planning for 750 MHz. It requires a strategic decision with foresight to know where to stop the analog band. If the analog band stops at 450 MHz, that leaves 100 MHz for compressed digital. If the analog band is carried to 550 MHz, that leaves 100 MHz less bandwidth for digital. And, in the long run bandwidth used for digital could be more valuable than analog bandwidth. Therefore, while it is important to preserve bandwidth for analog services, it may be more important to determine the proper crossover frequency.

Marketing MOD

Critical to the success of MOD is how it will be marketed to subscribers. It must be marketed in such a way that motivates subs to buy MOD instead of going to the video store. First of all, it must provide a large selection of movie titles. While MOD may never have the number of movies that a video store has, it must have sufficient titles that allow cable to effectively compete with the video store. Release windows of movie titles must be equal to or earlier than their release to the video stores. The challenge to the cable industry is justifying equal or earlier release windows.

If MOD is to capture some of the video stores' revenue, its price must be competitive. Today, PPV is offered at a premium to subscribers for movies that have been in theaters for sometimes a year and in the video stores for months. Clearly cable should demand a premium for delivering first run movies to the home. However, if the price is too high, subscribers will opt to drive the five to 10 minutes and rent at the video store. Price sensitivity is high for movies and the cable industry will have to adjust the price until it finds the price point that subscribers are more willing to buy MOD instead of going to the video store and renting the same movie.

In addition, if MOD is to be successful, the technology must allow ordering of movies to be simple. The home terminal should employ a "tease and sell" method to encourage the subscriber to buy movies. This includes showing the subscriber a free preview and encouraging the buy with on-screen prompts. The purchase sequence should be no more than a few key strokes on the remote control.

Summary

MOD is the next new PPV technology to be deployed. The key is to provide a service that more closely resembles the selection and convenience of a video store if the industry is to compete more effectively with video stores and grow its PPV revenues. However, this cannot be accomplished without the proper technology.

Systems must be designed with extended bandwidth and eventually use digital compression technology. Operators must carefully plan their upgrade strategy and take into consideration how much bandwidth to build and how much to leave analog without changing the appearance of the service to subscribers. The technology also must be simple for the subscriber to use and not be intimidating. Decisions we make today largely impact the way MOD will be implemented in each of our systems. If carefully considered, these decisions will result in a MOD PPV service that competes effectively with video stores and provides revenue growth to the industry. **CT**

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Subscriber-ready cable?

(Continued from page 36)

of cells or characters that represent one letter or one region of the screen. Within each character we can choose which cells to illuminate. Consistent with modern practice, we show characters that are made up of cells in a 5x7 array. This is about the minimum size array that will make acceptable characters.

In a character-based environment we have characters, which are predefined sets of cells illuminated. We need only transmit the identity of the character we wish to display. If we just want to display letters and numbers we need only 36 characters. Since we might want to display some punctuation and perhaps some special symbols (such as arrows) we expand our library of characters to, perhaps, 64.

We thus need transmit only one piece of information — the character we wish to display. We also may transmit certain optional attributes such as the character color, whether it should blink and whether to allow the picture to show through cells not illuminated or whether to make the non-illuminated cells an optional color.

Sixty-four characters can be uniquely defined using only 6 bits of information. Add a few bits for attributes (color, blink, etc.) and you still have only a few bits to completely describe the space occupied by the character. The penalty we pay is that we cannot display anything that is not in our predefined character set. If a system wanted to display its logo, it would be out of luck unless it could be made out of the predefined characters.

The alternative is to provide bit-mapped graphics as shown in the lower part of Figure 4 back on page 36. Here we work with the same basic character space but we specify individually the cells to be illuminated. We can make any shape we wish. We could expand the cell structure to the entire TV screen, specifying any display we wanted. The penalty is the amount of information we must transmit (and store in the cable box). Rather than transmit 6 bits to specify the character, we now must transmit 5 x 7 = 35 bits, the contents of each and every cell in that character space.[7] Thus, we went from 6 bits to 35 to describe the cell group, and we haven't described any attributes. This adds cost to the box and delay in the transmission path, as we must transmit and store much more information.

As the cost of memory has come down, second-generation advanced boxes will be able to add limited bit-mapped display features, though the manufacturer is still walking a tight line between acceptable displays and cost.

Virtual channels

With expanded OSD capability and higher bandwidth addressing systems, it will be possible to display virtual channels — channels that consist of only text and limited graphics. They don't take up 6 MHz of cable spectrum as do real channels, but they look like character and maybe graphic channels to the subscriber. These could carry messaging, news, sports scores or whatever else someone wants to program.

The virtual channels will look the same as would teletext channels, which introduces a whole set of marketing concerns. Teletext is big business in Europe, but all of the experiments in North America have led to discontinuance of the service. Many reasons have been advanced for the failure of teletext in North America, but they usually seem to come back to the fact that not enough people cared. Was this because none of the experiments of the early '80s reached a critical mass of users? Did the users not have the right services? Was the billing structure wrong? We will likely open up all of these old issues again as converters having the capability for virtual text channels are deployed.

On-screen program guides

Of all the enhancements due out, probably none is as potentially as significant to the subscriber as is an on-screen program guide. These are often called electronic program guides, or EPGs. A number of proponents are positioning themselves now to be providers of EPGs. These will display a grid (usually) of program choices now and for the next few hours. To watch a program, all a subscriber need do is to scroll through the list (which will take many screens), find a desired program, press a button on the remote control and the box tunes to that channel.

The concept may be expanded to what has been called a mood guide — a packaging and presentation concept in which the subscriber indicates preferences for types of shows (sports, news, movies, etc.) and all of the available selections are presented. Some have even suggested that a subscriber could identify himself to the box, which would keep track of the programs watched over some length of time. After that the box would recommend shows of the type that the sub has watched in the past.[8]

A related advancement is that, with an IR blaster (more on this later), it will be possible to instruct your VCR to record the show on now, or to program it to record a later show. (The converter knows the selected show, so it can tune accordingly.)

The technology to do this is in advanced development now, but several things must happen before on-screen guides become a reality. Several proponent systems are being developed and each has its own patents and proprietary developments. There may be some conflicts between these. In addition, the infrastructure must be completed to allow the correct program guide information to be downloaded to each headend. The headend must add the correct channel information (not needed by the couch potato, but needed by the box) and perhaps correct times. Local programming information must be added somehow and last minute changes must be accounted for. If the program guide information is sold to subscribers, it must be tagged as to what information is to be provided to which subscribers.

National program information will likely be distributed to subscribing cable systems on the vertical blanking interval of one or more programming services. PBS has been exploring this method of data distribution for a long time. This information will be delivered to headends, where it must be massaged for local needs, and distributed on the cable system.

All of this will take time to work out, but the boxes to use the displays are being designed now. Some manufacturers are planning to use their own proprietary format for data transmission and display, with a computer system at the headend to translate any providers' data to that format. Others are planning to offer the format of one of the on-screen guide providers only. The fact that this area is so fluid brings us to another of the new features.

Downloadable software

The cost of RAM (random access memory) is coming down sufficiently to

encourage manufacturers to include the capability of downloadable software. The boxes will be shipped from the factory with software installed in some sort of RAM. (We prefer the term *modifiable memory* as being more descriptive, but we shall reluctantly conform to the accepted practice of calling it RAM.) This RAM may be constructed of any one of several available technologies. It must be electrically alterable but it must survive for an extended time without power being supplied to the converter. This can be achieved with battery backup of static RAM or with electrically erasable permanent memory of several varieties. The only software in ROM (read only memory — the traditional way of storing programs in converters) is a small kernel that permits the manufacturer to download new software using the normal addressable data link.

Security considerations will probably dictate that the download of new software not be something that can be done from equipment normally installed in the headend. Manufacturers will likely want to bring in new software and maybe hardware to effect the download.

Having the capability to download new software protects the operator from a situation in which new features are needed, or the industry goes a different way with a certain "look and feel." Operators can download new software to meet new demands. It would be a surprise if one or more converter manufacturers don't eventually need to download new software for the EPG, because the concepts for EPG are so very new. We will likely decide in three to five years that whatever we did in 1994 was not right and we need to change it.

IR blaster

This is a concept in which an extension from the converter contains an IR transmitter that is placed in front of the VCR's remote control receiver to allow the converter to talk to the VCR. The concept also can work in reverse: Some VCR manufacturers have announced VCRs with a blaster to control the cable box. Through this, the VCR can be controlled just as if you were using its remote control. This is the way that the EPG can be used to control recording of programs.

Expansion ports

The box needs to have some place to plug in the IR blaster, as well as other not yet developed interfaces. Accordingly, new converters will incorporate some sort of interface with the outside world. The interface could be a PC-compatible serial port, but will likely be something simpler and proprietary due to cost considerations. One concept is that it will be used for the IR blaster. Another possible application is to control a remote converter for recording.

Remote or dual converter

A long-time problem has been that it is not possible to watch one scrambled program while recording another. One solution is to build a dual converter, one that has two tuners and descramblers. One is used for the TV set and the other for the VCR. Most of the circuitry of the first converter must be duplicated for the second, but there could be savings in the power supply, case, remote control and remodulator. Only one on-screen display is needed, and the subscriber can use it to control either converter.

Some manufacturers see a limited

market for such a device and prefer instead to offer a second, remote converter. It would interface with the main converter through the expansion port.

One can let one's mind run to all sorts of blue sky applications for this port. We hate to put predictions on paper, but we'll go this far: While it is possible to hook a fax machine or printer to the port and have your newspaper delivered this way, we don't look for that to happen in the foreseeable future. It may be that this will become a port to the home automation industry via its CEBus communications standard (developed by the Electronic Industries Association), allowing control between the converter and other equipment. This is not being planned at this time, but is a possibility for the future.

Digital compression converter

We have no desire to go very far out on the limb on this subject. However, based on the experience of seeing many ideas come, go and return, we will be very surprised if compression to the home becomes a significant activity in the next few years. There is no doubt that the technology is there to do the job, though we are likely to find some unanticipated problems. However, the costs don't appear to justify widespread introduction of the technology in the next few years. We believe that there is room for at least one more generation of analog boxes before the digital-to-the-home era arrives.

The same cannot be said for compression over the satellite. There is a clear and quantifiable economic advantage for compression here and we expect to see it become more commonplace over the next several years. Even here, though, there are problems. We are dealing with an entirely new technology and experience teaches that introductions of such radical departures from previous technology take longer than expected. There are interesting non-technical issues that have not been dealt with yet. For example, consider the plight of the backyard dish owners who have invested in an earth station and a decoder, only to find that they now must invest in a more expensive decoder. What will they be saying to their congressmen?

On the other hand, we have what appears to be a viable DBS provider who is planning to be up next year with compressed TV to the home. The next few years are going to be interesting! **CT**

End notes

[1] The Electronic Industries Association has assigned the standard the designation "EIA-563." It is now officially an accepted U.S. standard, being recognized by the American National Standards Institute.

[2] We are aware of only one high-end VCR that had the multiport connector. Some observers thought the multiport standard would have been better served by putting the connector on VCRs before putting it on TV sets, since VCRs are purchased more frequently than TV sets.

[3] Manufacturers tell us that the interest level has increased considerably as a result of the cable bill becoming law. One large cable system already announced it will install the technology.

[4] Some of the early remote controls were wired and carried analog tuning voltages, with sometimes unexpected results as connectors corroded and dogs found a new source of chew toys.

[5] The problem has been mitigated thanks to a standard channel identification system developed by the joint EIA/NCTA Engineering Committee, presently known as EIA IS-6. This is an interim number and will likely be replaced this year with a normal EIA number. An extension of the plan to 1 GHz is actively being considered and will likely be promulgated as the -A revision to IS-6 (with new EIA number) soon.

[6] As an aside, I used to have a VCR switch in my entertainment center at home. I removed it one day when the kids wanted to record one channel and watch another in a configuration that took rewiring of the signal path. I couldn't find the schematic of the switch and the labeling wasn't sufficiently descriptive for me to rewire without it. If an MSEE with 20 years in cable TV (who *can* program a VCR) can't get the darn thing to work, what will your grandmother do?

[7] A bit is used for each cell. If it is a 1, the cell is illuminated; if it is 0, the cell is not illuminated.

[8] Question to ponder: Is the *artificial* intelligence in the box or on the couch?

May 1993

Is that drop grounded?

BACK TO BASICS

The training and educational supplement to Communications Technology magazine.

Gerri Saye

Table of Contents

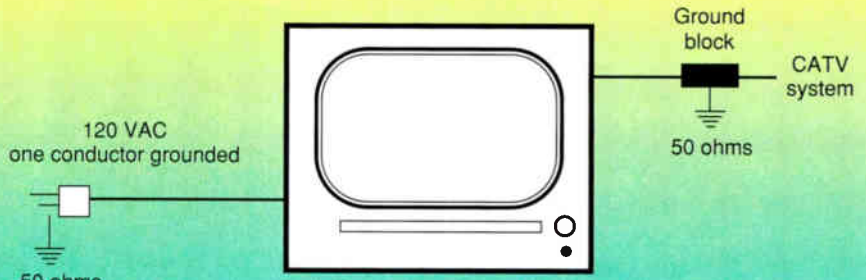
Grounding and bonding of CATV drop cables

By J. Richard Kirn
Director of Development, Far East and Pacific Basin
Times Fiber Communications

In 1971 The National Electrical Code (NFPA 70-1970) addressed cable TV systems for the first time under Article 820. The NEC is either adopted directly or indirectly through reference in the building codes into local statutes in virtually every community in the United States. The code established firm requirements for bonding and grounding of the CATV cable in homes, offices, stores, etc. There has been a lot of confusion (caused by a lack of training) in the CATV industry over the years with regard to the exact requirements.

The National Electric Code established a single building ground. The bonding together of all grounding electrodes to form a single building grounding system helps to protect equipment and people from shock and damage caused by lightning induced voltages, power switching transients, power lines falling on communications lines, etc. Let's look at what happens if each service (power, phone, CATV, water, etc.) had separate grounds at the home. Table 1 shows some ground resistances of a 5/8-inch, 5-foot ground rod in various soils.

Figure 1: TV set connected to CATV and house power systems



Note that grounds or ground rods are not perfect, 0 Ω resistance. Figure 1 illustrates a TV set connected to a CATV system and the house power system.

Both grounds have a reasonably good resistance of about 50 Ω. The power system that has an extensive outside distribution system is subject to a current surge from lightning or switching transients. From Table 2 it is not unrealistic to assume an induced momentary current of 1,000 amperes flowing in the power line ground. This amount of current is not unusual. It could be, and often is, considerably more. According to Ohm's law, the power ground will rise momentarily to a potential of 1,000 amperes x 50 Ω = 50,000 volts. However, the CATV ground is still sitting there at ground potential, resulting in 50,000 volts across the TV set. The same situation would exist if the current surge was on the CATV cable. As you can see it is quite easy to generate voltages sufficient to destroy components in converters and TV receivers, ignite flammable materials and potentially electrocute a subscriber.

"Heating of the drop cable or large blue arcing when attaching ground conductors ... is indicative of a serious ground fault in the building and the cable drop should be removed."

The solution is to bond between the power ground and the CATV ground. Now both grounds go up and down together and the TV set does not see

Table 1: Earth resistivity of different soils measured per three-point method

R & *p*	Resistance* in Ω 16 mm (5/8") x 1.5 m (5') rods			Resistivity in Ω/cm³ or Ωcm		
Soil fills	**Avg.**	**Min.**	**Max.**	**Avg.**	**Min.**	**Max.**
Ashes, cinders, brine waste	14	3.5	41	2.37	500	7
Clay, shale, gumbo, loam	24	2	98	4.06	340	16.3
Same, with varying proportions of sand and gravel	93	6	800	15.8	1.02	135
Gravel, sand, stones with clay or loam	554	35	2.7	94	39	458

*National Bureau of Standards Technical Report No. 108.

Table 2: Lightning parameters

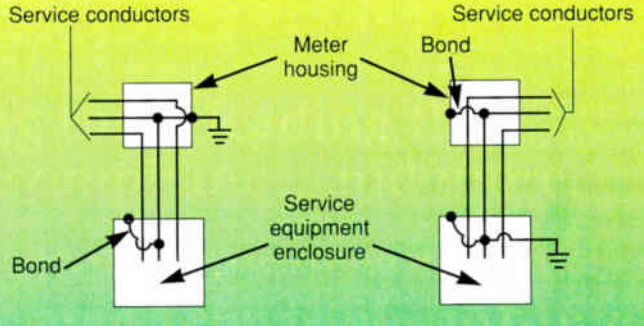
Parameter	90%**	50%**	10%**	Maximum observed	Number of observations
Crest current	2 to 8 kA	10 to 25 kA	40 to 60 kA	230 kA	4,150
Current rate of rise per pulse (10 to 90% crest value)	2 kA/µs	8 kA/µs	25 kA/µs	50 kA/µs	40
Total stroke duration	0.01 to 0.1 s	0.1 to 0.3 s	0.5 to 0.7 s	1.5 s	100
Duration of a single pulse in a stroke	0.1 to 0.6 ms	0.5 to 3.0 ms	20 to 0.7 s	400 ms	150
Time interval between end of one pulse and start of next pulse	5 to 10 ms	30 to 40 ms	80 to 130 ms	500 ms	525
Time between start of pulse and half crest value on decay side	10 to 25 µs	28 to 42 µs	52 to 100 µs	120+ µs	425
Time to crest for a single pulse	0.3 to 2 µs	1 to 4 µs	5 to 7 µs	10 µs	45
Number of pulses in an individual stroke	1 to 2	2 to 4	5 to 11	34	500
Time for atmosphere to recharge after a stroke so that another stroke will be produced	—	20 µs	—	—	—

Note: Range in values caused by variations in observations.
** Percent of strokes that will have parametric values exceeding those indicated.
Source: *Lightning and Lightning Protection* by Hart and Malone.

any voltage difference across it. The bonding together of all grounds (power, phone, CATV, water, etc.) forms a monolith building ground system, which protects equipment and people from high voltage potentials. This is exactly what the code requires.

In practice, the CATV drop should be located in the general vicinity of the electric service entrance if possible, with a ground wire run from the ground block to the main electrical ground. Figure 2 illustrates the two different types of grounding arrangements in the electrical service entrance permitted by the code. The ground wire coming out of the meter housing or service equipment enclosure (fuse or circuit breaker box) goes to the building ground, and in many cases is a grounded metallic cold water pipe when it exists.

Figure 2: Meter housing grounding arrangements



On the left is a grounding electrode conductor at the meter housing with the service equipment enclosure bonded to the grounded service conductor. On the right is the grounding electrode conductor at the service equipment with the service equipment enclosure and the meter housing bonded to the grounded service conductor.

Priority grounding points

The CATV ground block must be bonded to the building structure ground. Some of the common bond locations in order of priority are as follows:

1) A metallic *cold* water pipe that is continuous and in contact with earth for a minimum of 10 feet. Where water is provided by private well, the cold water pipe and well casing must be bonded together. The 1993 code prohibits connecting beyond 5 feet from the point of entrance of the pipe. If the connection is made on the output side of a water meter, a #6 copper jumper shall be installed across the water meter.

2) Customer electrical service grounding electrode or grounding conductor, using a separate approved clamp.

3) Customer electrical service equipment cabinet or panel, provided that the cabinet manufacturer provides a suitable clamp, stud or screw that is used for no other purpose.

4) A *metallic* conduit between the load side of the watt-hour meter and the customer's service entrance panel or equipment cabinet, provided that paint and rust are removed from the conduit before attaching the grounding clamp or strap.

5) A *metallic* conduit between the weatherhead and meter pan, provided the supplying electric utility does not object. A ground thus attached must be 12 inches (minimum) from the power conductors.

6) To the meter pan, if the meter pan has a welded grounding stud provided for communications system grounding, or use a special meter pan bonding connector (such as the Sachs SC51), and if the supplying electric utility does not object.

7) An 8-foot by 5/8-inch driven ground rod — *provided that the ground rod is bonded to the building grounding electrode system with a #6 copper bonding jumper.*

The CATV ground block shall be located as close as practical to the point where the CATV drop passes through the exterior wall, floor slab, etc. The ground wire shall be insulated, not smaller than #14 AWG copper and

TECH TIPS

Trouble call reduction — Revisited

By Keith Bell
Chief Technician, Heritage Cablevision

The reasons for subscriber phone calls to the cable office can be placed into three broad general categories:

1) Billing
2) Technical
3) Services offered (e.g., PPV, additional outlets)

The purpose of this article is to look at different options to prevent what necessitates a phone call by the subscriber. Keep in mind though, nothing is foolproof. There will always be phone calls generated no matter what steps are taken by office and field personnel.

A customer handbook is issued at the time of installation that contains a wide array of information. It covers a majority of the issues that could result in a sub placing a call to the cable office, including an explanation of billing, simple set of steps to check before placing a trouble call, the channel guide, converter hookup directions and information concerning pay-per-view. A couple of questions come to mind:

- Is this too much information at one time?
- Does the customer take the time to review before calling?
- Does the customer keep the material for when future needs arise?

Now let's make an assumption: All steps and precautions have been taken to provide the information needed to the customer. However, now the customer still has a question or needs service of some type or manner. At this point our prime concern should be to resolve any service problem or answer any question as quickly as possible. This is not to say that a representative of our company should rush a conversation with the customer, but should provide information quickly and be assured that the customer understands the information being given.

"If ... training is needed, let's not delay in providing it because ultimately the customers suffer — which in turn makes the company suffer."

If it is a service-related problem, our rep should make every effort to help the customer correct the situation over the phone. To accomplish this task, two things must take place:

1) The representative must appear confident in the questions that are asked of the subscriber.

2) The customer must be willing to try to correct the problem.

Hopefully, if this can be accomplished, the customer's problem has been corrected expeditiously, the customer has become more knowledgeable about our service and what it has to offer, the company rep becomes more confident in his or her telephone skills, and finally a truck roll by a technician or installer has been saved, which in turn saves money.

The goal's customer satisfaction

Now still on the minds of the general manager and office manager is the National Cable Television Association's recommended standard of answering phone calls within 30 seconds. So I guess we are back to a situation of trying to accomplish certain goals targeted for different departments, but ultimately all goals end up with customer satisfaction as the reward.

Can we mesh all these goals and still provide customer satisfaction along with saving the company money? I feel that there are solutions but they will need to be designed for each individual system. How can we accomplish this?

Firstly, it will require technical personnel to spend a few extra minutes with customers in their homes explaining services offered and answering questions. Most importantly, this must be done consistently every day with every customer.

Secondly, if a customer calls in, our approach should be that a representative will make every effort to answer any question or try to work out any service problem that can be corrected over the phone.

Extra training may be required for company personnel to become confident in the skills needed to accomplish the two points just mentioned. This training can come in a variety of forms. Examples of some training could be letting office personnel ride with technicians on calls, having technical personnel occasionally train office staff at weekly meetings about such topics as VCRs and troubleshooting skills over the phone, and also having office personnel attend weekly technical meetings to relay problems encountered with customers that may have been avoidable had certain steps been taken by the technician or installer while in customers' homes.

Most importantly, if this training is needed, let's not delay in providing it because ultimately the customers suffer — which in turn makes the company suffer. **BTB**

Consumer home

(Continued from page 28)

Several cable operators are avidly exploring ways to offer personal communications services (PCS) via a combination of the cable network and the phone line. And, in the United Kingdom, where there are no regulatory restrictions, telephone companies and cable operators are working together to deliver telephony services to subscriber homes via the same route.

What's ahead

Cable TV is truly an integral part of the subscriber home. Tomorrow, it may become an indispensable part of that home.

What's next? How about PCTV? The power of a PC and the ease of a TV set.

The inclusion of computer technology into a cable TV converter — transforming the cable converter to a "compuverter" — will unfurl a whole new arena of services and programming options. It will expand the possibilities of on-screen program guides and offer a platform for the fertile minds of creative computer programmers.

From there, the possibilities are limitless. This compuverter can be used to control such functions as home utilities, turning on lights and heat, controlling water flow and measuring energy usage. Finally, it will offer the doorway to the next level of interactive multimedia services the cable subscriber has been awaiting.

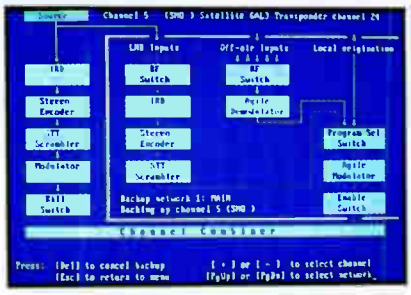
Cable can truly become more than a part of the home entertainment section — it can be the heartbeat of the home. **CT**

Keep Your Revenue Flowing

Pay-per-view, PCS, movies-on-demand, interactive services . . . the list of additional revenue streams grows each day. And, as these services increase, system reliability becomes more critical.

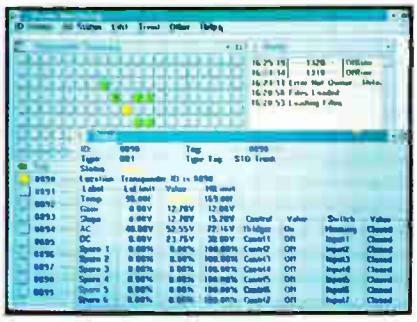
With the right management system for your headend, fiber or traditional distribution network, you can provide dependable, profitable cable service.

Headend failures are rare, but when they do happen, all subscribers are affected. With Scientific-Atlanta's Headend Manager™ system controller, not only can you monitor your headend, you can also provide automatic backup service. As a result, you reduce downtime, truck rolls and customer complaints.



Headend Manager system controller headend status display.

Finding the source of a problem in your fiber or distribution network can be time consuming — and expensive. Seeing a *potential* problem could be virtually impossible. Our Network Manager™ controller can pinpoint the exact location of a weak or faulty piece of equipment. So you solve the problem immediately, possibly even before it affects your subscribers.



Network Manager controller transponder alarm detail screen.

Keep your revenue flowing with the right management system. Contact your nearest sales representative or call 800-722-2009 to learn more about the headend or distribution system that's right for you.

Scientific Atlanta

Our customers are the winners.

PCS

Southwestern Bell Mobile Systems and Panasonic Communications & Systems Co. introduced what will be the first commercially available personal communications service (PCS) provided in the United States, according to the companies.

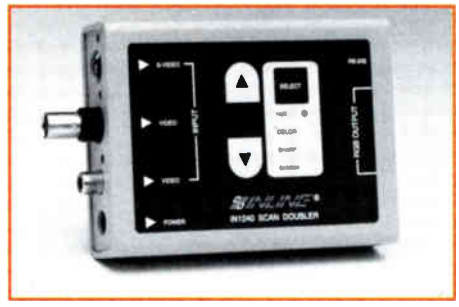
The FreedomLink PCS is a wireless business phone system that employs cellular technology and operates as an extension to any existing office phone system including a PBX, Centrex or key system. It uses cellular frequencies at low power to communicate with the office telephone system. With a system handset (pocket phone), an employee can travel freely throughout an office, factory or business complex placing and receiving calls. When the employee leaves the system environment, the pocket phone operates as a regular cellular hand-held phone using the external cellular system.

When a system user receives a call, both the pocket phone and the user's desk phone ring. Users can answer calls at their desk or from wherever they are located, allow a secretary to answer it, or the call can be directed automatically to voice mail. A visual indicator on the phone then alerts the user that a call has been received.

The system includes a central control unit that connects to a company's existing telephone system. This enables users to keep the same office phone number as their permanent desk extension. Base stations, about the size of a door chime, are mounted on the wall throughout the building or complex and relay calls between the pocket phones and control unit.

System pocket phones provide up to five hours talk time or 18 hours standby per charge. Talk time on the external cellular system is 2-1/2 hours with standby capacity of 18 hours.

Reader service #208



Scan doubler/ universal decoder

Inline Inc. says its new IN1240/1540 is the smallest scan doubler ever. The unit is a hand-held, near-broadcast quality digital scan doubler and universal decoder that converts NTSC, PAL and SECAM to an RsGsBs, RGBHV, RGBS or RGsB signal with a scan rate of 15.75 kHz or 31.5 kHz. The units offer a variety of features that can be adjusted through the top panel or via the RS-232 port.

Reader service #206

PC/OTDR conversion

3M Telecom Systems Group announced a product line of printed circuit boards used in laptop and desktop PCs that convert PCs into OTDRs.

The Photodyne 5300 Series PC-based OTDR system consists of standard sized AT-bus hardware add-in cards and OTDR software for standard DOS-based PCs. There are two basic PC-based OTDR card packages. The PC card package includes one add-in card, software, user manual and fiber connection kit; the OTDR system package includes factory installation of the board(s) into a laptop or portable PC.

The line offers six OTDR cards for measuring single-mode wavelengths of 1,310, 1,550 or combined 1,310/1,550 nm; and for multimode wavelengths of 850, 1,300 or combined 850/1,300 nm.

The system is operated through menu-driven software running on a PC. A one-button fiber feature measurement automatically scans the fiber trace and measures distance, loss and back reflection values for all fiber features. It can quickly locate a break in the fiber and clearly indicate the location of the end of the fiber, according to the company. The results are presented in a table that stores and prints with the trace file.

The software's main menu displays laser status, parameters, measurements such as relative distances between two points and signal loss, a distance bar graph to indicate the part of the distance range being viewed, full-color trace display and a full selection of menu function keys.

The OTDR hardware cards can be installed in laptop PCs for on-site testing or in desktop PCs for centralized testing. Multiple single-mode and multimode cards can be installed in one PC for different types of fiber applications. Each board has a Class I laser for measurement.

Reader service #207

Cable lasher

The new C Lasher from GMP can lash cables of diameters up to 1-3/4 inches, with strand sizes from 1/4- to 3/8-inch. The unit can be loaded with one or two 1,200-foot coils of .045-inch diameter wire to lash multiple cables. A special version of the unit also can lash .065-inch diameter stainless steel wire.

Weighing 33 pounds, the unit includes a built-in safety brake to prevent backroll and comes complete with pulling rope and 16-pound storage chest. The snap hook on the pulling rope is proof-rated to 5,000 pounds.

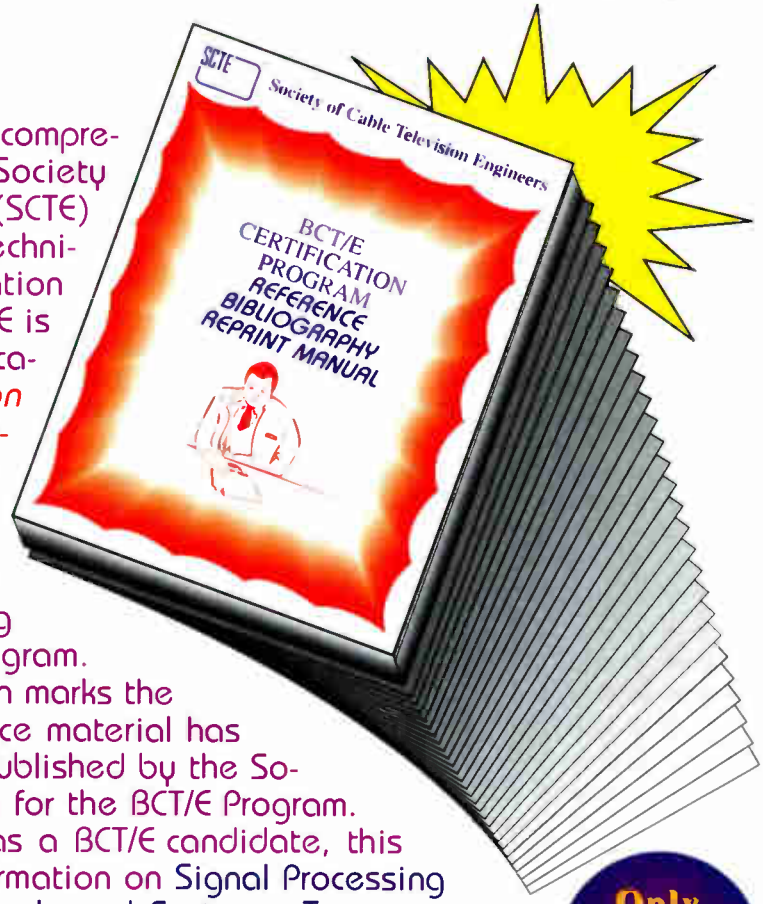
Reader service #204

AD INDEX

It's so simple! To obtain additional information from any of the display advertisers appearing in this issue of ***Communications Technology,*** please use one of the **Reader Service Cards** on the facing page (pass the others along). The ad index below has been expanded to include not only the page number of each advertiser, but also each corresponding reader service number to be circled on the Reader Service Card.

IT'S HERE AT LAST, BY POPULAR DEMAND!

Attention BCT/E Candidates:



If you've been waiting for a comprehensive study guide for the Society of Cable Television Engineers (SCTE) Broadband Communications Technician/Engineer (BCT/E) Certification Program, the wait is over! SCTE is proud to announce the publication of the *BCT/E Certification Program Reference Bibliography Reprint Manual*, a deluxe book collecting reference materials recommended as study materials to assist BCT/E candidates in preparing for Categories I-VI of the program. This fully authorized publication marks the first time this valuable reference material has been officially compiled and published by the Society for use as study material for the BCT/E Program. Even if you are not enrolled as a BCT/E candidate, this manual offers a wealth of information on Signal Processing Centers, Video and Audio Signals and Systems, Transportation Systems, Distribution Systems, Data Networking and Architecture and Terminal Devices. It's a must for any cable TV technology library!

Only $19

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❑ Please send me ____ copies of the *BCT/E Program Reference Bibliography Reprint Manual* at $19 each.

❑ A check or money order for the appropriate amount shown above and made payable to the Society of Cable Television Engineers is attached.

❑ I wish to pay by credit card (please check one)

❑ MasterCard ❑ Visa Account Number: _____ Card Expires:___/___

Signature for Credit Card: _____

BOOKSHELF

The following is a listing of videotapes currently available by mail order through the Society of Cable Television Engineers. The prices listed are for SCTE members only. Non-members must and 20% when ordering.

- *Outage Reduction Techniques* — This program features Scott Bachman of CableLabs and Robert Moel of Paragon and provides point-by-point discussion of the findings of the CableLabs Outage Reduction Task Force. It covers a variety of topics, including how consumers view cable service, the impact of outages with respect to frequency and duration, outages vs. downgrades, outages vs. plant powering and fusing/plant protection policies. A discussion also is provided on system relability, including MTBF, MTBR, failure rate and device relability vs. system reliability. (65 min.) Order #T-1119, $45.
- *Standards Deviations* — Featuring the Federal Communication Commission's Michael Lance and John Wong, this program continues where Video #T-1112 leaves off. It provides a current update on the status of cumulative leakage index (CLI) filings and a paragraph-by-paragraph discussion of the new FCC regulations. In this workshop, Wong provides a unique insight into FCC thinking on each topic. (1 hr.) Order #T-1120, $45.

Note: Videos listed this month were recorded at Cable-Tec Expo '92 in San Antonio, TX. They are in color and available in the 1/2-inch VHS format only. Videotapes are available in stock and will be delivered approximately three weeks after receipt of order with full payment.

Shipping: Videotapes are shipped UPS. No P.O. boxes, please. SCTE pays surface shipping charges within the continental U.S. only. Orders to Canada or Mexico: Please add $5 (U.S.) for each book or videotape. Orders to Europe, Africa, Asia or South America: SCTE will invoice the recipient for additional air or surface shipping charges (please specify). "Rush" orders: a $15 surcharge will be collected on all such orders. The surcharge and air shipping cost can be charged to a Visa or MasterCard.

To order: All orders must be prepaid. Shipping and handling costs are included in the continental U.S. All prices are in U.S. dollars. SCTE accepts MasterCard and Visa. To qualify for SCTE member prices, a valid SCTE identification number is required, or a complete membership application with dues payment must accompany your order. Orders without full and proper payment will be returned. Send orders to: SCTE, 669 Exton Commons, Exton, PA 19341 or fax with credit card information to (215) 363-5898.

A listing of other publications and videotapes available from the SCTE is included in the March 1993 issue of the Society newsletter, "Interval."

DEMODULATOR

Suitable for most CATV, Broadcast, LPTV and MMDS Applications

The CADCO 375 frequency agile demodulator (375T with T-channel option) economically satisfies many CATV, TV station, LPTV and MMDS requirements for demodulating an RF audio/video television signal to baseband audio and video.

☛ The 375 is controlled by a front panel microprocessor.

☛ The 375 features multiple output configurations such as video/4.5 MHz audio subcarrier (system M/N) separately selectable or as a composite and two additional standard video only ports, an external composite RF loop and Composite and Vertical Sync output ports.

☛ The 375 contains Synchronous Detection and a Zero Chopper circuit.RS-232 control is an option.

☛ For international application, the 375 is available in Systems B/G, D/K and I in PAL color.

☛ The CADCO 375 Demodulator and all other CADCO frequency agile and fixed channel headend equipment is sold by SELECTED Domestic and International Distributors.

☛ International users please note CADCO manufactures in the United States fixed channel and frequency agile headend processors and modulators for systems B/G, D/K and I.

Contact your distributor or CADCO direct for further information.
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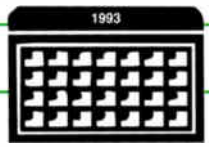

May

10-11: SCTE Bluegrass Chapter seminar, installer/tech troubleshooting, outage prevention control, new FCC legislation, BCT/E exams, Lexington, KY. Contact Alan Reed, (502) 389-1818.

10-11: Scientific-Atlanta training seminar, distribution, Atlanta. Contact S-A, (404) 903-6306.

11: SCTE Desert Chapter meeting, Installer and BCT/E exams, Southland Cablevision, Redlands, CA. Contact Doug Williams, (619) 340-1312, ext. 277.

11: SCTE Magnolia Chapter seminar, satellite antenna retrofit and troubleshooting, digital compression, Ramada Coliseum, Jackson, MS. Contact Steve Christopher, (601) 824-6010.

11: SCTE New York City Chapter seminar, public relations, regulatory and engineering joint venture, TCG, Staten Island, NY. Contact Rich Fevola, (516) 678-7200.

11: SCTE Palmetto Chapter seminar, FCC technical standards and new legislation, Greenville, SC. Contact John Frierson, (803) 777-5846.

11: SCTE Sierra Chapter seminar, emerging technologies and competition. Contact Steve Allen, (916) 786-2469.

11: SCTE Wheat State Chapter seminar, passives, design considerations and terminal devices. Contact Lisa Hewitt, (316) 262-4270, ext. 191.

11: SCTE Delmarva Meeting Group seminar, fiber architecture/alternate access, drop connectors, Del Tech-Terry Campus, Dover, DE. Contact Bill King, (302) 674-3440.

11-13: Philips mobile training course, RF and video distortions, headend basics, amplifier applications, record keeping and maintenance, Portland, OR. Contact Yvonne Jordan, (315) 682-9105.

11-14: Seicor's fiber-optic training course, Hickory, NC. Contact (800) SIECOR1, ext. 5539 or 5560.

12: SCTE Big Sky Chapter seminar, Installer Certification Program, Locomotive Inn, Laurel, MT. Contact Marla DeShaw, (406) 632-4300.

12: SCTE Heart of America Chapter seminar, Kansas City, MO. Contact Don Gall, (816) 358-5360.

12: SCTE Mid-South Chapter meeting. Contact Bob Allen, (901) 365-1770, ext. 4110.

12: SCTE Oklahoma Chapter seminar, emerging technology, Oklahoma City. Contact Rick Martin, (405) 525-2771.

12: SCTE South Jersey Chapter seminar, fiber-optic construction practices, fiber splicing and fiber testing, Ramada Inn, Vineland, NJ. Contact Mike Pieson, (609) 967-3011.

12-13: SCTE Ohio Valley Chapter seminar, safety. Contact Jon Ludi, (513) 435-2092.

12-14: Scientific-Atlanta training seminar, headend and earth station, Atlanta. Contact S-A, (404) 903-6306.

13: SCTE Satellite Tele-Seminar Program, *Advances in Corrosion Protection*, Transponder 14, Galaxy I. Contact SCTE, (215) 363-6888.

13: SCTE Badger State Chapter seminar, RF design and upgrade architectures, Holiday Inn, Fondulac, WI. Contact Brian Revak, (608) 372-2999.

13: SCTE Gateway Chapter seminar, passive devices, Overland Community Center, Overland, MO. Contact Chris Kramer, (314) 949-9223.

13: SCTE Penn-Ohio Chapter seminar, real-world fiber applications, Installer and BCT/E exams, Sheraton Hotel, Warrendale, PA. Contact Marianne McClain, (412) 531-5710.

15: SCTE Cactus Chapter, Installer and BCT/E exams, Tucson, AZ. Contact Harold Mackey, (602) 352-5860, ext. 135.

15: SCTE Chaparral Chapter seminar, preventative maintenance and sweep, Installer and BCT/E exams, Albuquerque, NM. Contact Scott Phillips, (505) 761-6253.

18: SCTE Chattahoochee Chapter seminar, Cable Act, headend upgrades and architecture alternatives, Atlanta. Contact Hugh McCarley, (404) 843-5517.

18: SCTE Ohio Valley Chapter seminar, working with utilities, Cleveland. Contact Weldon Feightner, (513) 941-7000.

18: SCTE Rocky Mountain Chapter seminar, FCC standards. Contact Ron Upchurch, (303) 790-0386, ext. 403.

18-20: Philips mobile training course, RF and video distortions, headend basics, amplifier applications, record keeping and maintenance, Bellingham, WA. Contact Yvonne Jordan, (315) 682-9105.

19: SCTE Appalachian Mid-Atlantic Chapter seminar, video compression, BCT/E exams, Holiday Inn, Chambersburg, PA. Contact Richard Ginter, (814) 672-5393.

19: SCTE Florida Chapter seminar, video and audio signal, outage control, data networking and architecture, Holiday Inn, Ft. Lauderdale, FL. Contact John Tinberg, (407) 747-4998.

19: SCTE Golden Gate Chapter seminar, BCT/E Category V, data networking and architecture. Contact Mark Harrigan, (415) 358-6950.

19: SCTE Great Plains Chapter seminar, proof-of-performance, Quality Inn Crown Court, Bellevue, NE. Contact Randy Parker, (402) 292-4049.

19: SCTE Michiana Chapter meeting. Contact Russ Stickney, (219) 259-8015.

19: SCTE Ohio Valley Chapter seminar, working with utilities, Cincinnati. Contact Weldon Feightner, (513) 941-7000.

19: SCTE Piedmont Chapter seminar, employee relations, Installer and BCT/E exams, Hickory, NC. Contact Mark Eagle, (919) 477-3599.

20: SCTE Greater Chicago Chapter seminar, signal processing, Quality Inn, Palatine, IL. Contact Bill Whicher, (708) 362-6110.

20: SCTE Lake Michigan Chapter seminar, emerging technologies, Downtown Days Inn, Grand Rapids, MI. Contact Karen Briggs, (616) 941-3783.

20: SCTE Mount Rainier Chapter seminar, Tacoma, WA. Contact Gene Fry, (206) 747-4600, ext. 107.

21: SCTE Central Indiana Chapter annual Speedway Track outing. Contact Gregg Nydegger, (219) 583-6467.

25-27: C-COR seminar, basics of fiber optics, Columbus, OH. Contact Kelly, (814) 231-4422.

26: SCTE Great Lakes Chapter seminar, video and audio, Holiday Inn, Livonia, MI. Contact Jim Kuhns, (313) 445-3712.

30: SCTE Lake Michigan Chapter seminar, emerging technologies. Contact Karen Briggs, (616) 947-1491.

Planning ahead

July 14-16: Rocky Mountain Cable Expo, Snowmass Village, CO. Contact Teresa Hart, (303) 863-0084.

July 31- Aug. 3: Wireless Cable '93, Orlando, FL. Contact (319) 752-8336.

Aug. 16-18: Great Lakes Cable Expo, Indianapolis. Contact (317) 845-8100.

Aug. 25-27: Eastern Cable Show, Atlanta. Contact (404) 252-2454.

Oct. 5-6: Atlantic Cable Show, Atlantic City, NJ. Contact (609) 848-1000.

June

2: SCTE Ark-La-Tex Chapter seminar, safety. Contact Randy Berry, (318) 238-1361.

3: SCTE Chesapeake Chapter seminar, video compression/HDTV, Columbia, MD. Contact Scott Shelley, (703) 358-2766.

3: SCTE Great Plains Chapter meeting, Installer and BCT/E exams administered, Courtyard Cafe, Bellevue, NE. Contact Randy Parker (402) 292-4049.

6-9: National Show, San Francisco. Contact NCTA, (202) 775-3669.

8: SCTE Cascade Range Chapter meeting, Holiday Inn, Wilsonville, OR. Contact Cynthia Stokes, (503) 230-2099.

8: SCTE Desert Chapter seminar, CLI, San Gorgonio Inn, Banning, CA. Contact Greg Williams, (619) 1312, ext. 277.

8: SCTE Sierra Chapter seminar, customer service training. Contact Steve Allen, (916) 786-2469.

8: SCTE Southeast Texas Chapter meeting, Warner Cable, Houston. Contact Tom Rowan, (713) 580-7360.

9: SCTE Badger State Chapter seminar, installer training, Installer exams, Warner Cable, Greenfield, WI. Contact Brian Revak, (608) 372-2999.

10: SCTE Satellite Tele-Seminar Program, *SLMs: The Technician's Edge (Part One)*, Galaxy I, Transponder 14. Contact SCTE, (215) 363-6888.

12: SCTE Cascade Range Chapter meeting, BCT/E exams, Paragon Cable, Portland, OR. Contact Cynthia Stokes, (503) 230-2099.

15: SCTE Chattahoochee Chapter meeting, Installer and BCT/E exams, Cox Communications, Atlanta. Contact Hugh McCarley, (404) 843-5517.

15: SCTE Ohio Valley Chapter, SCTE/CTAM golf outing, Foxfire Country Club, Columbus, OH. Contact Jon Ludi, (513) 435-2092.

16-18: USIMTA Wireless Communications Legislative Conference, Madison Hotel, Washington, DC. Contact Raymond Linsenmayer, (202) 973-2878.

28-30: SCTE Technology for Technicians II Seminar, Indianapolis. Contact SCTE, (215) 363-6888.

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Industry safety — A demanding requirement

By Bill Riker
President, Society of Cable Television Engineers

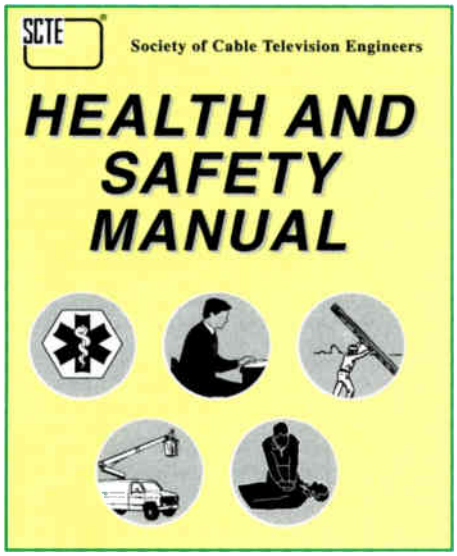
Four years ago, the Society began speaking to its members about Occupational Safety and Health Administration and the safety requirements the federal government has established that the cable industry must follow. As we continued to gather more and more information about OSHA and safety, we found that the ramifications of non-compliance with the rules and regulations were more onerous than those of not complying with the FCC rules for signal leakage and CLI, and had far more devastating consequences for cable systems and companies.

Initially, we found that almost every cable system was not only not in compliance with the rules, but that most of them had no idea what the rules and regulations were about. To try to address this problem, the Society instructed its director of training to gather more data and information about OSHA and the safety requirements that apply to the cable industry, and to distribute this information to its members in order to keep them apprised of what they need to know. We have been trying to do this by speaking at regional and state association meetings, as well as through our own chapter and meeting group meetings.

When we first started talking about OSHA at these meetings, no one in attendance had ever seen an OSHA inspector at their system. But that no longer holds true. Today, at almost every meeting or seminar on safety, there is at least one attendee whose system has had some contact with OSHA. There has been a noticeable increase in awareness of OSHA and safety concerns in the cable TV industry, but we still find that even the best systems have areas that are not quite up to compliance standards — usually in relation to the Hazardous Materials Program and providing the required general safety training. We also find that, although many managers have appointed a safety coordinator for their system, they usually are not aware of the requirements of the job. Some managers also have little idea of what they need to know about OSHA, nor are they aware that they could be charged with criminal negligence and sent to prison under certain circumstances because they failed to comply with their managerial responsibilities regarding safety. To help with this problem, the Society has created a one-day seminar about OSHA and safety for managers and safety coordinators, which is presented monthly in various locations around the country.

The following is a preliminary schedule of dates and locations for the remainder of 1993:

- May 6 — Kansas City, MO
- July 1 — Indianapolis
- July 22 — Denver
- Aug. 12 — Baltimore
- Sept. 30 — Las Vegas, NV
- Oct. 21 — Harrisburg, PA
- Nov. 18 — Savannah, GA
- Dec. 9 — San Antonio, TX



Print resources

For the past several years, the Society has been working on two manuals that will be of great value to every cable system. The first is the SCTE *Health and Safety Manual*, recently published and now available to the industry. This publication is filled with information that is designed to be used to accomplish compliance with OSHA's general safety training requirements. The chapters cover all phases of safety information for all cable employees, from managers and office workers, CSRs and warehouse personnel, to technicians in the field. In addition, there will be additional chapters published on a continuing basis so that all changes in the regulations will be kept current.

The second book, to be published soon by the Society, is the *OSHA Information Manual*, designed to help cable systems understand OSHA rules and regulations as they apply to the cable TV industry. It includes general safety requirements, as well as those in the Hazardous Materials Program. This manual will be filled with examples of what systems need to have as a part of their safety program, from the corporate level all the way down the "chain" to individual systems.

We would like to encourage readers of this magazine to take this article to their managers to make them aware of the fact that they can be held accountable for their personal responsibilities regarding safety. We want them to know that the Society is available to help them meet their safety education and training needs. For more information, please contact SCTE Director of Training Ralph Haimowitz at (704) 297-5423. **CT**

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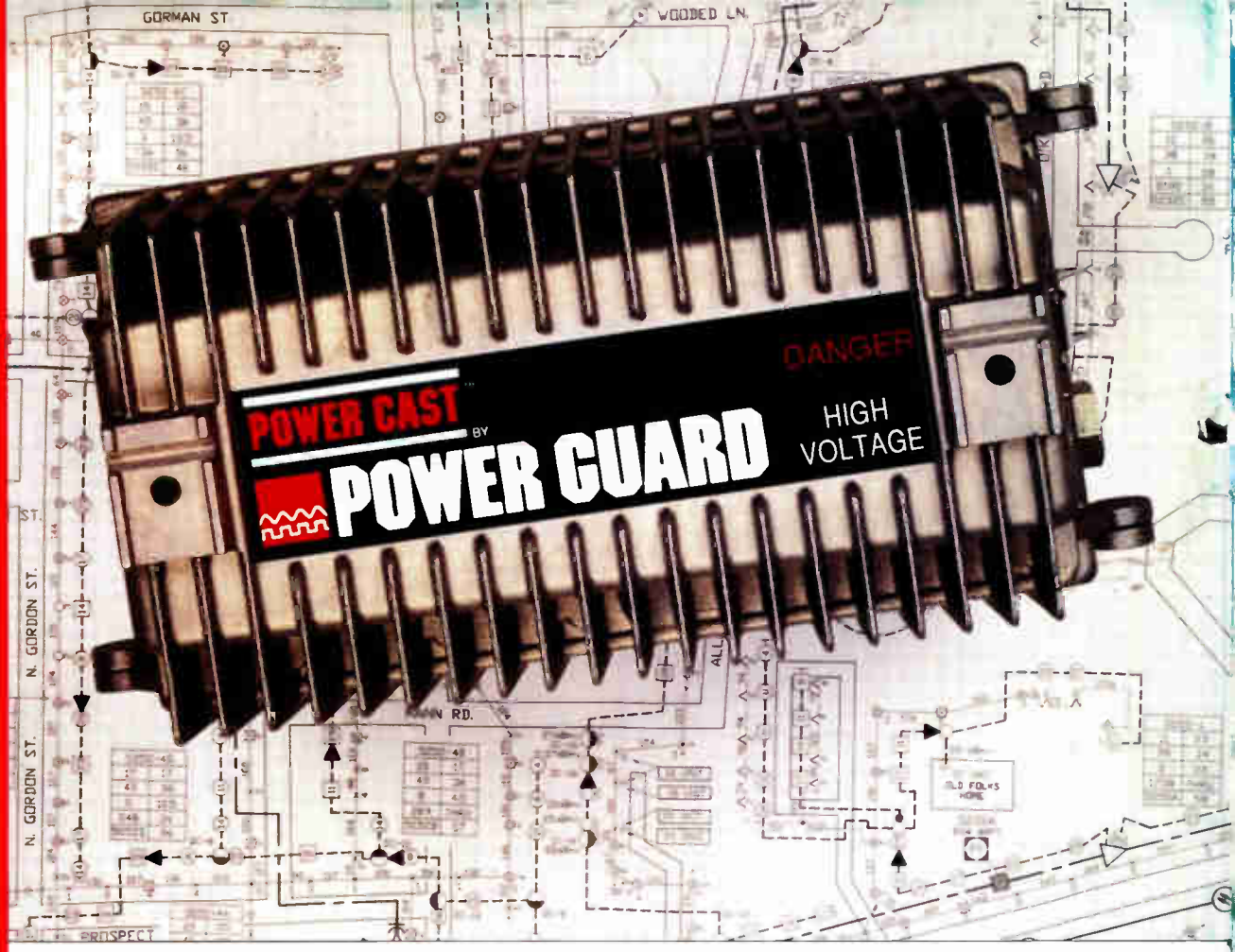

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