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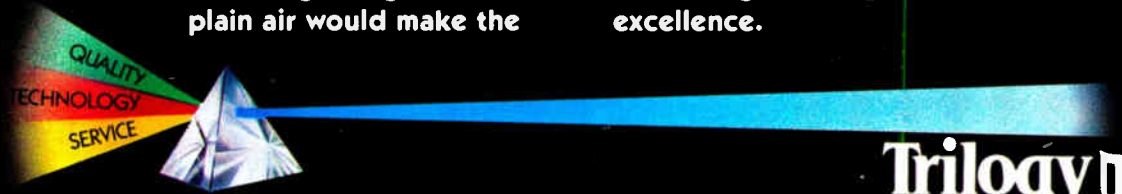

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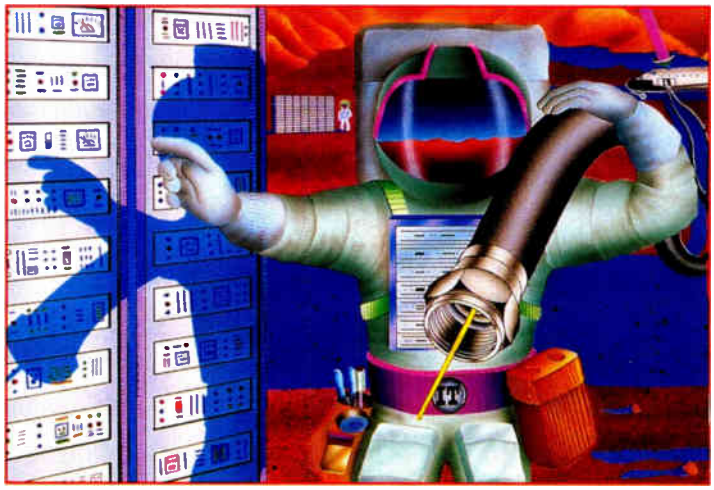

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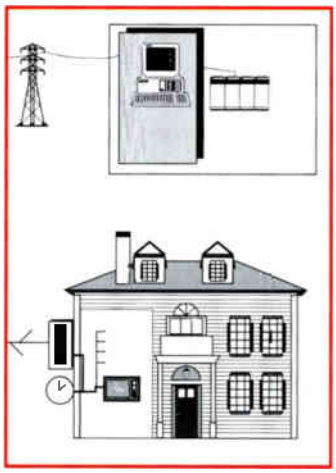

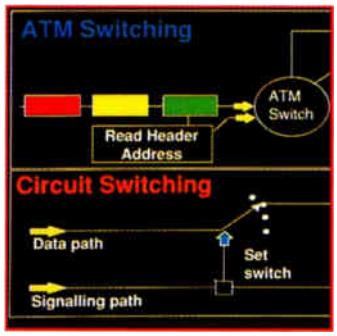

Features

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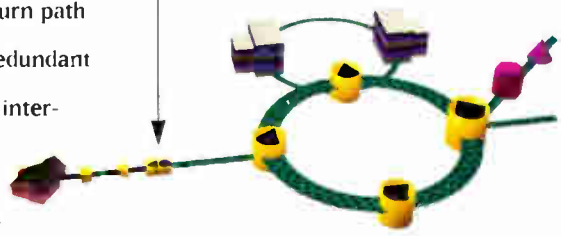

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EDITOR'S LETTER

Reviewing the road map

The U.S. cable TV industry today has its broadband networks wired in front of more than 95% of all TV households. (I've heard figures as high as 97%, but who's counting?) Well over half are connected to those networks. On the surface, it looks as if we're well positioned to be the "last mile link" on the much hyped electronic information superhighway, primarily because of the tremendous bandwidth we have at our disposal.

But there's something wrong with this picture.

Where's the market?

At least in the beginning, I think the major expressways of the so-called superhighway will be used by businesses, not the suburbs of the typical Joe Sixpack-'s home. And guess what part of most cities the local cable company usually doesn't serve? Right on: the business community.

Consider the market potential of the two areas. Businesses are big users of data communications, computing, e-mail, teleconferencing, fax and other telecommunications technologies. The home market — with the possible exception of recreational computer users and telecommuters (those folks who work "electronically" out of their homes) — is primarily a user of media-related broadcast technologies such as television, video and audio services.

In the nearly 22 years I've been in cable, a significant home market for advanced interactive services simply has not developed, despite the availability of broadband networks with two-way capability.

And contrary to what some have predicted, I don't anticipate the demise of the MSO as we know it anytime soon, nor do I expect that cable TV operation in residential areas will change substantially during the next four or five years. There may be fewer MSOs because of consolidations and mergers, but I think the cable TV side of what we do won't be a whole lot different from today. (Of course, I could be wrong on this last item. Quality, reliability and good customer service might actually have to become a reality if competitors like DirecTv are reasonably successful.)

If we want to be serious players on the forefront of the information superhighway, we will have to change our attitudes about building plant in commercial and business districts. This will require forward thinking about architectures, construction techniques and even our core operating strategies. Payback in a commercial or business environment is a lot different that what we're used to from residential areas. From my perspective, I can see two parallel operating paths: The residential model, which will remain much like what it is now, and the business version, which will be our on-ramp to the superhighway.

Even while all of this is going on, our market analysts and researchers will have to figure out what will make the superhighway work in the residential environment. After all, there is incredible potential in the home market and it will play a role, even if it's down the road a bit. But for now, let's not forget about the business market.

Ronald J. Hranac
Senior Technical Editor

Reader Service Number 12

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Vive la Révolution!

Grand Alliance selects subsystem

WASHINGTON, DC — The digital high definition TV (HDTV) "Grand Alliance" made its final major technical decision and selected the digital transmission subsystem that will be used in the HDTV system being proposed to the Federal Communications Commission.

In cooperation with the FCC's Advisory Committee on Advanced Television Service (ACATS), the Grand Alliance concluded extensive testing of the Zenith VSB and General Instrument QAM transmission subsystems. Both the VSB (vestigial sideband) and QAM (quadrature amplitude modulation) technologies demonstrated substantial performance improvements over previously tested systems.

Based on performance, the Grand Alliance selected VSB technology for HDTV transmission via terrestrial broadcast and cable. The key factors in the selection process were HDTV coverage area, minimal interference with existing analog TV signals and robustness of the digital signal.

Data collected during the six weeks of testing at the Advanced Television Test Center in Alexandria, VA, were analyzed in conjunction with the ACATS Spectrum Analysis Working Party (Planning Subcommittee/Working Party 3). Testing was conducted in cooperation with the ACATS, the ATTC, CableLabs and the Grand Alliance.

The selected approach will be refined further to accommodate Grand Alliance MPEG-2 (Moving Picture Experts Group) data packets and to include technical components from GI's QAM adaptive equalization. Prior to integration into the system, the 8-VSB transmission subsystem will be field tested in Charlotte, NC. QAM will be available as the backup transmission subsystem. The complete system is scheduled for final verification testing late this year and final field testing in early 1995.

US West forms interactive company

NEW YORK — US West formed Interactive Video Enterprises Inc. The newly formed company, a wholly owned subsidiary of US West Marketing Resources, will design, develop, distribute and promote interactive TV services in order to capitalize on the evolution of new technologies such as broadband distribution networks and multimedia communications systems.

With the announcement of the company, three senior executives were appointed to IVE: Robert Grant, president; Kevin Randolph, executive vice president; Andrew Orgel, executive vice president.

☛ Time Warner Cable announced that the rollout to customers of its interactive Full Service Network project in Orlando, FL, will begin in the fourth quarter to allow for additional refinement of the underlying system software and the set-top terminal. Plans remain in place to have 4,000 customers on the network by the end of this year. In other news, the company selected TV Guide On Screen as the on-screen guide for the network. Also, the company entered into a three-year purchase agreement with Scientific-Atlanta for up to 1 million 8600[x] home communications terminals and signed a firm purchase order for 500,000 units over the next two years.

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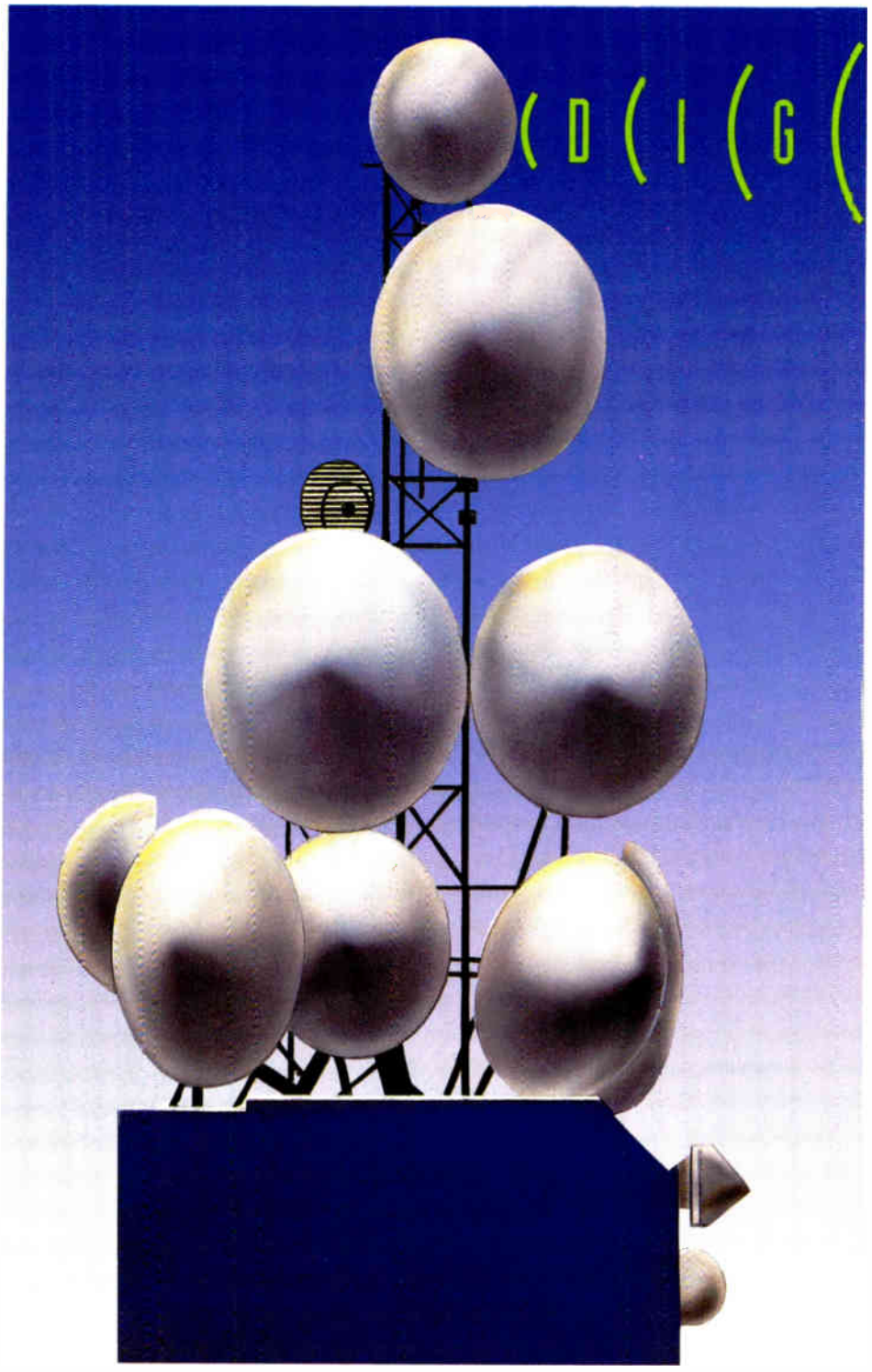

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System Delay: 1 TV Frame
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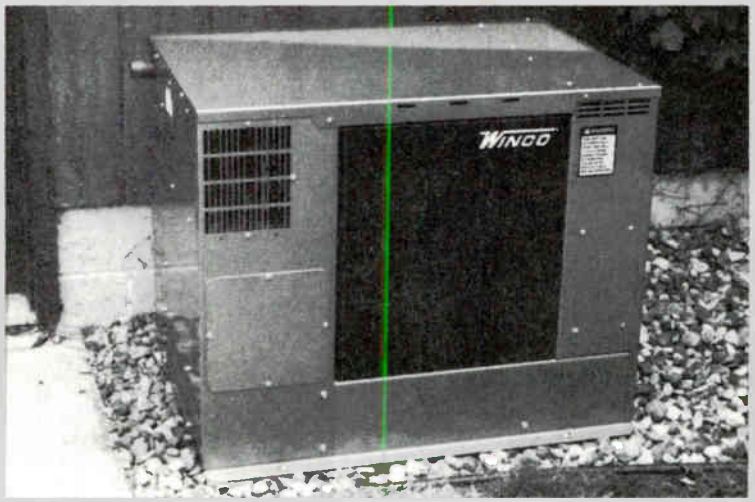

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Cable Games hit Texas Show

SAN ANTONIO — Another installment of the ever-popular series of Cable-Tec Games was played out recently at the Texas Cable Show. This is the fourth time the competition has been sponsored at this particular convention.

The big winner was Doug Henserling who took a total of four medals, including the overall gold. Brad Hutchins was the silver all-around medalist with Lee Skinnel taking the bronze.

Wendell Woody

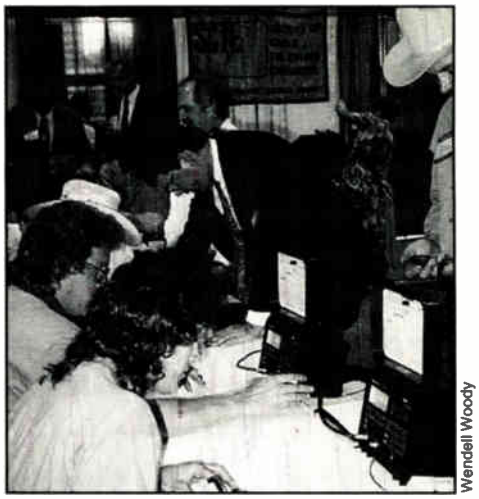
SCTE President Bill Riker, Lee Skinnel (overall bronze medalist), Brad Hutchins (overall silver medalist), MC Diana Riley, Doug Henserling (overall gold medalist), and MC Jack Trower at the Cable-Tec Games awards.

Specific events included fiber-optic splicing (sponsored by 3M and Multilink); test equipment operation (sponsored by CaLan and Riser-Bond); cable splicing (sponsored by Comm/Scope and Gilbert Engineering); and signal level techniques (sponsored by Trilithic and Wavetek). The Games were sponsored by ANTEC Cable Group, *Communications Technology* and the Society of Cable Television Engineers.

Installer/technician contestants making up four teams dashed from station to station displaying skills they use every day on the job. Both speed and quality of work were taken into consideration as the medal winners were picked.

Jack Trower of WEHCO Video and Diana Riley of Jerry Conn Associates kept things lively as masters of ceremonies, as did Director of Games Wendell Woody (of Sprint).

The big team winners dubbed themselves the Kable Kings. Team members included Pete Kaiser, Gary Lloyd, Shane Barrett and Brad Hutchins. — *Laura Hamilton, "Communications Technology"*



Wendell Woody

Contestants turn their cable technical know-how into gold, silver and bronze at the Texas Show '94.

SCTE sponsors Texas tech sessions

SAN ANTONIO — The second day of the Texas Show, the Society of Cable Television Engineers sponsored three technical forums.

Tongue firmly in cheek, Ted Hartson of Post-Newsweek Cable subtitled his "FCC

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Matters — Proofs, Leakage and Compliance" workshop "Same Old Stuff." He focused on how a system should put together its proof-of-performance book for the FCC. He reminded everyone that the proofs don't have to be sent to the FCC, but just kept up to date at the system offices in case the FCC requests to see them. The key to his talk was simple: Be sure the information you have in your proofs is representative of your entire system. This will save a lot of headaches later. Hartson invited everyone back for "the same old stuff" at next year's Texas Show.

"Current Events and What's on the Technology Horizon" featured Moderator Dan Pike of Prime Cable, Ralph Haimowitz of the SCTE and Wendell Bailey of the National Cable Television Association. Haimowitz updated everyone on the SCTE's work as a member of ANSI. The Society is trying to become an approved submitter of standards to ANSI. This is an extremely involved process but a goal the SCTE is putting heavy effort toward. Bailey covered FCC Washington news and focused on compatibility. He warned that we can expect the FCC to keep calling for more and more compatibility between consumer electronics and cable equipment. If cable people don't become as involved as consumer electronics equipment people, it's obvious that the consumer electronics' industry will have the upper hand when it comes down to final standards.

Rounding out the technical program for the show was the "Digital Compression Update." Tele-Communications Inc.'s Tom Elliot moderated and kept panelists on their toes with questions on this hot topic. TCI's David Beddow highlighted the company's digital compression delivery system in Denver including what he called the "bricks and mortar" (the plant's physical facilities). Geoffrey Roman of General Instrument considered how digital compression evolved as a delivery system for cable. He also outlined the benefits to consumers including 400, 500 or 1,000+ channels and the dramatic increase in picture quality. Scientific-Atlanta's Gary Trimm wrapped things up with a status report on S-A's digital projects with Time Warner (Orlando, FL) and US West (Omaha, NE). He said the company's "blueprint for the superhighway" included the following stages: adding interactivity and bandwidth to analog networks, deploying digital broadcast networks, and finally providing full-service on-demand digital networks. — *Laura Hamilton, "Communications Technology"*

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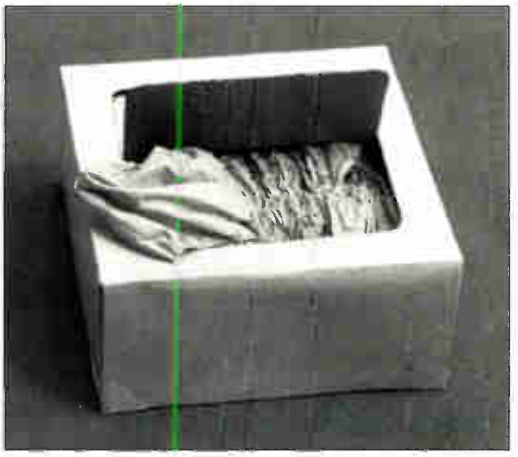

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Reader Service Number 16

Decisions, decisions: Purchasing ad insertion gear

By James Kelso
Technical Operations Manager
for Advertising Sales
Cox Cable

If you're in the market for ad insertion gear today, be prepared for frustration and confusion. Oh, the vendors themselves are pleasant, competent professionals. Their products are generally solid. However, the variety of equipment offered and the choice of insertion methods can leave you reeling.

Network break times (approximate)

	Break time	Variance	Best to share with
CNN	:29, :56	±1 min.	Discovery or MTV
ESPN	Various	N/A	N/A
USA	Various	N/A	N/A
TNT	:15, :30, :45	±5 min.	N/A
Nashville Network	:29, :59	±2 min.	Discovery or MTV
Discovery Channel	:15, :45	±5 min.	Any :29 and :59 nets
MTV	:20, :50	±5 min.	Any :29 and :59 nets
Lifetime	:29, :59	±2 min.	Discovery or MTV
Family Channel	Various	N/A	N/A
A&E	:29, :59	±2 min.	Discovery or MTV
Headline News	:29, :59	±1 min.	Discovery or MTV
Nickelodeon	:55, some at :20	±2 min.	N/A

The basics

There are a few things all ad insertion devices have in common: They control a playback device; they listen for network cues; and they can switch between network and local sources. There the similarities end. The playback devices can be tape players, laserdiscs or hard drives and decompression cards. Commercials can be accessed sequentially or randomly. A single channel of insertion can cost you $15,000 or you can get four for $8,000.

The following identifies some of the key options you have as a purchaser of insertion gear, what they cost and what their benefits are.

Sequential, full random and random pod

One of the more expensive differences in insertion gear is an operational one. How much flexibility do you get in what spot plays back when? The simplest units give you very little. This is called sequential insertion. In sequential insertion, the insertion operator creates a tape reel with commercials in one-minute pods, one after the other. The inserter has a single playback deck and every time a cue comes from the network, one of the pods is played back. The inserter works in sequence from the first pod on the tape to the last and then rewinds the tape to start again.

Sequential insertion has two key advantages. For starters, it's cheap. A sequential inserter can be bought for less than $2,000. In fact, through shared insertion, you can insert sequentially on four networks for a little over $7,000 (playback deck included). The other key advantage is that sequential insertion is simple to implement and relatively bulletproof. Sequential does, however, have one key limitation: Specific spots can only be played at specific times through human intervention. Sequential is ideal for self-promotion, startup commercial insertion and for expanding an existing insertion operation onto less profitable channels. Inserters in this class include Channelmatic's Li'l Moneymaker and SpotMatic Jr., Texscan's CSR-191 and several others.

Across the flexibility spectrum from sequential insertion is full random insertion, often referred to as just random insertion or random access. Random insertion provides the ability to play back any commercial on the reel or multiple commercials in combination. Full random inserters can cost anywhere from $3,000 to $10,000.

In full random operation, an analog inserter is usually paired with two or four playback decks. These decks are loaded with tapes prepared with 30- and 60-second spots. The inserter is programmed with a list of commercials to run, the times to run them at and shuttles the tapes back and forth to play back different spots as programmed.

There are several advantages to full random insertion. First, obviously, is the ability to play specific spots at specific times without human intervention. This makes the sale of commercials in specific programs and sporting events a more viable option. As "fixed position" spots command a higher price, the presence of full random insertion can have a significant impact on the bottom line. Other benefits include reduced editing, greater capacity for spot storage and greater variety in the spots played back.

Full random does have disadvantages as well. Full random is more complex, requires programming, significantly increases wear on tape machines and is decidedly not bulletproof. For high volume ad sales operations, however, it is the best choice simply because of flexibility. Full random is not appropriate for extremely remote headends, other situations where access is limited, or in operations where servicing the insertion system cannot be a high priority. Examples of full random systems include Texscan's CSR-192, 194D, 292D, 294D and Channelmatic's Adcart series, as well as all proposed digital playback systems.

The middle ground between full random and sequential is an odd territory called random pod. It combines the single deck operation of sequential with the random-like ability to access any pod in any sequence. It has most of the advantages of full random but also has

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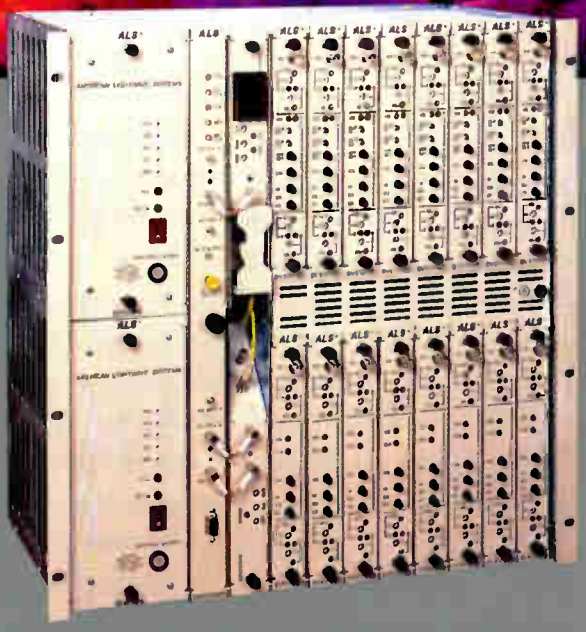

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all of the disadvantages. One further disadvantage is that most traffic and billing systems or scheduling programs have a very difficult time making a random pod schedule. Some lack the capability altogether. Though frequently used simply for sequential insertion, the Texscan CSR-191 is a good example of a random pod inserter.

"The variety of (ad insertion) equipment offered and the choice of insertion methods can leave you reeling."

Dedicated, dynamic and shared insertion

One of the unfortunate facts of ad insertion is that the equipment for any one channel is only in use for a couple of minutes out of each hour. Typically, networks allow cable operators to take two minutes an hour of local breaks, usually at the bottom and top of each hour (:29 after and :59 after). On top of these two minutes of insertion, the equipment might spend another four or five minutes out of the hour getting cued up for the next insertion or performing some other housekeeping task. The rest of the time the unit just sits there, using power, occupying space and depreciating.

Thankfully, there are still a few networks that take regular breaks at times other than the top and bottom of each hour and thereby make shared insertion possible. Shared insertion occurs when one inserter with attached playback devices is used to insert on more than one network. For instance, a single inserter could be used to insert commercials on CNN and Discovery. CNN breaks at :29 after and :56 after each hour. Discovery takes breaks around :15 after and :45 after. An insertion system capable of switching between the two could handle both tasks with plenty of time left over to cue up spots.

Several models of inserter are capable of just that: Channelmatic's Adcart series as well as Texscan's CSR-292D and 294D are all capable of sharing two networks. Some sequential models, such as Channelmatic's Li'l Moneymaker and SpotMatic Jr. are capable of sharing up to four networks as they do not require time to recue after each spot.

It should be noted that the ability to share is affected by which networks are included in the insertion lineup. Some networks break too unpredictably or too frequently to be shared (including ESPN, USA, TNT and most regional sports networks). CNN, Headline News, TNN and Lifetime, however, break fairly regularly around the top and bottom of the hour. They can share, with varying effectiveness, with networks like Discovery, MTV, VH-1 and A&E, which break between :10 and :25 after and :40 and :55 after. The accompanying table on page 18 shows rough break times for major networks. Insertion vendors will be able to provide recommended pairings.

For the networks that break unpredictably or too frequently, dedicated insertion is the appropriate choice. In a dedicated system, one inserter and its playback devices are assigned to only one network, around-the-clock. Texscan's CSR-191 and -192 are good examples of dedicated inserters. Also, most inserters capable of shared insertion can be used in a dedicated mode.

The last option in this category is dynamic insertion. In a dynamic system, all playback devices are pooled together and allocated as needed to individual networks. The theory is that since the networks do not all break at the same time, there should be a number (n) such that with n playback devices, all of the breaks can be played without ever needing more than n devices. It's a good theory, and for the most part, very workable. It is, however, most appropriate for large installations where the savings are significant enough to warrant the added complexity. Systems of this type were previously manufactured by LaKart Automation, now Basys-LaKart. The forthcoming analog and digital inserters from Starnet also will employ this system.

Analog and digital insertion

The greatest opportunity for confusion and frustration in an insertion equipment decision lies in the realm of digital insertion. When will systems be widely available? What will the picture look like? How reliable will they be? How long will any given format last? All of these questions and many more come to mind when you start to talk about digital insertion.

Digital insertion should hold several advantages over analog. How great these advantages are remains to be seen. The first of these advantages is

cost. In terms of purchase price alone, digital systems will likely be more expensive than their analog counterparts. However, when that cost is annualized and labor, consumables and repairs factored in, it becomes apparent that for larger systems, digital insertion will likely cost less to own and operate than analog.

The calculation works like this: Analog gear has a relatively fixed cost per channel. That is, the first channel of analog gear is no more expensive than the last. Digital, on the other hand, has some basic costs associated with it for encoders, servers and off-line storage no matter how many channels are purchased. The first channel of digital gear is extremely expensive but subsequent channels are cheaper.

On the other hand, maintenance, labor and consumables for an analog installation increase substantially as the number of channels inserted on increases. Digital expenses for labor, repair and consumables, however, remain relatively flat no matter how large the system gets. For small systems, digital will be more expensive to own and operate. For larger systems, especially multiple headend or multi-zone systems, digital will become substantially cheaper, perhaps by as much as 50%. This author's calculations point to 15 channels as the break even point. For systems with more than 15 channels, digital should cost less.

Other advantages associated with digital insertion are quality, reliability, reduced time-to-air and increased portability. Quality has long been the Achilles heel of cable ad insertion. Now, some digital vendors are promising resolutions on par with Betacam SP. If you've seen fourth generation 3/4-inch tape on-air, you know the advantage here goes to digital. The reliability advantage also should go to digital. Many of today's hard drives can be purchased with five-year replacement warranties. The same certainly cannot be said of playback decks.

"For those who hate 3/4-inch decks or want to build very large ad insertion systems, digital is the place to be."

Time-to-air and portability improve with digital as well. With digital, each spot simply has to be compressed and then transmitted to the headends. With analog, masters must be edited, dubs made and the resultant tapes couriered to the headends. The time savings could be measured in days.

Looking at these reasons, digital systems certainly seem appropriate for larger ad insertion operations. Analog, however, enjoys one clear advantage regardless of the size of the system. That is, analog is here today. Analog playback is a known commodity with few, if any, surprises. Until the same can be said of digital insertion, there is still some reason for staying in the analog world.

Comparisons to analog aside, there are several factors to keep in mind when looking at digital insertion systems. First, be conscious of the trade-off between spot quality and storage space. Higher quality spots take up more room and a system that holds 500 spots at 3/4-inch quality may only hold 100 spots at Betacam-SP quality. Second, get a feel for the life cycle of the encoding technology used in the system. JPEG systems, for instance, will become outmoded very rapidly. Find out if the vendor will offer an upgrade path from the current compression format to MPEG-2 and how much that will cost you. Further, find out how that vendor intends to handle full digital headends. Will they migrate to the same compression format as the headend data? How will they switch into the digital data stream? What will it cost for you to convert?

By the time you read this, several digital systems may be available. Current players in the digital insertion field include companies such as Channelmatic, Digital Equipment Corp., Multi-Vail, Starnet and Texscan.

Service and support

One final category where choices need to be made is that of service and support. Simply put, you can have it or you can suffer. The insertion industry to date has done a fair job of providing service and support. That is, brief periods of excellence mitigated by long periods of mediocrity. The good news is that the trend lately has been more toward excellence than mediocrity.

As a purchaser, make certain you outline your support expectations, and that the manufacturer you purchase from has both the motivation and the capability to meet those expectations.

(Continued on page 74)

MPEG-1: The right choice for local CATV advertising

By Thomas A. Walsh
Senior Vice President of Technology
Channelmatic Inc.

Geri Saye

Picking a digital platform is similar to buying a personal computer. Should you buy a PC or wait for the XT, XT or wait for AT, AT or 486, 486 or Pentium? For ad insertion, is it MPEG-1 or MPEG-2, shared-memory, traditional file server or video file server?

Your specific business is the key to what you choose. What are your actual needs? What can you afford? What is the return on the investment? Does the vendor know your business?

A system that enables you to achieve your goals and pays for itself during the next two years is the right choice. A system designed primarily for a theoretical future may not work well for the real now. A thorough knowledge of your actual operational requirements and the helpful tips found in this article will make a hero out of any technical or ad sales manager.

The magnitude of video

Digital video compression is a big advancement, similar to a change from film to video. Few really understand the magnitude and complexity of this change. Familiarity with PCs makes everyone a digital expert. This digital video stuff can't be that tough, right? Just plug-n-play. The benefits of digital over analog and the lofty goals of the superhighway are fueling the gold rush to digital. Be careful because the benefits of digital are not without a price.

MPEG-1 and MPEG-2

In the first step of converting analog video to digital, the encoding device digitizes and filters the analog signal into pixel values — lots of numbers between 0 and 255. The number of pixels per frame of video is referred to as the resolution of the video signal. The current choices available for MPEG pixel resolution are 704 x 480, 352 x 480, and 352 x 240 (doubled to 352 x 480 on playback, perceptibly 352 x 340). Just for comparison, the maximum resolvable resolution of composite NTSC, broadcast in analog over a 6 MHz carrier is 330 x 340 or 112,200 pixels per frame. One frame at 352 x 240 contains 84,480 pixels of information (perceptibly on playback 119,680). Every second, 30 frames of these pixel arrays must be processed. That's 2,534,400 pixels. A 30-second spot requires the processing of 76,032,000 pixels. No problem, new specialized superchips handle the job. It takes two of these superchips operating in parallel to do economical real-time MPEG-1 encoding at a 352 x 240 resolution.

Now at 704 x 480 we have 337,920 pixels per frame to process. That's 10,137,600 per second and 304,128,000 for a 30-second spot. To handle 704 x 480, it takes eight of these nice new superchips to process the pixels. If we are accustom to seeing 3,360,000 pixels per second at home on the TV set, do

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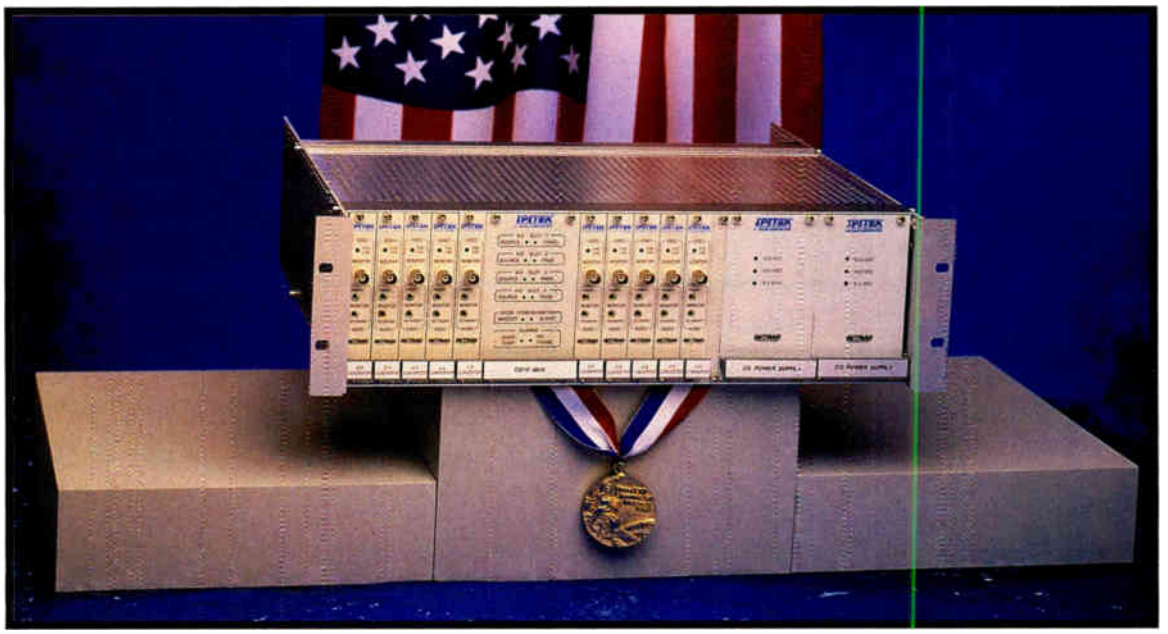

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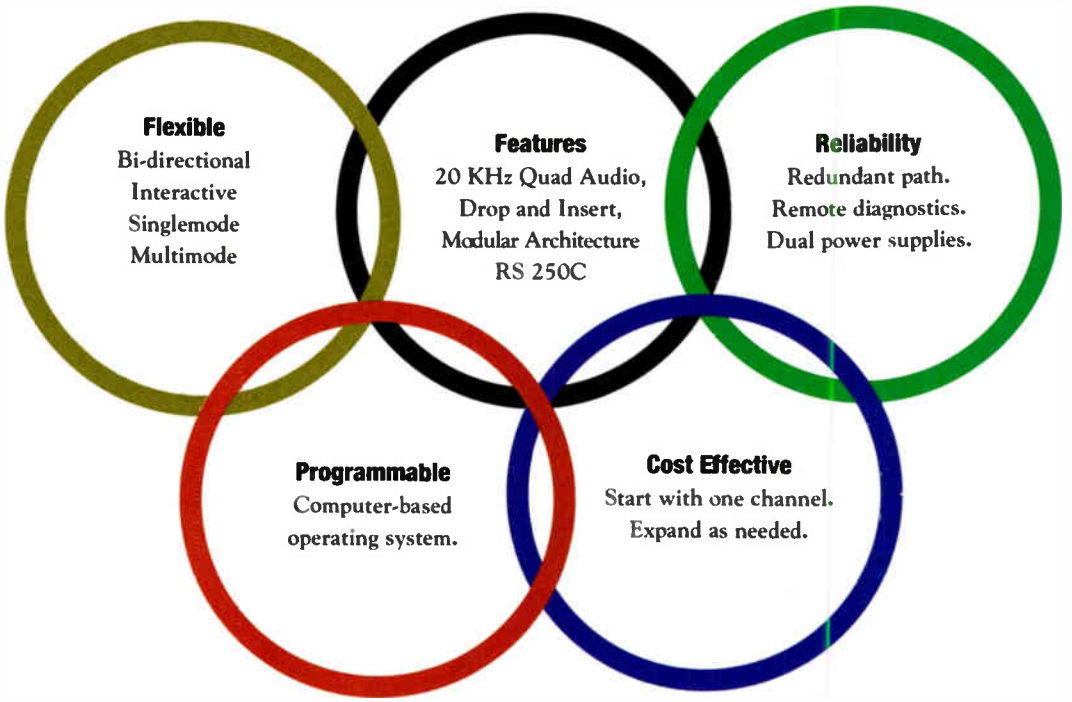

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we really need to see 304,128,000 of these things. I guess it depends on how much it will cost.

The MPEG-2 standard calls for compression on a field-by-field basis as compared to MPEG-1 on a frame-by-frame basis. MPEG-2 is designed for operation at 704 x 480 or 352 x 480 resolution.

The MPEG-1 encoder lumps the two fields together as a frame and then performs the compression algorithm, which includes cosine transforming, quantizing, zigzagging, run-length coding, and Huffman coding for I frames. Then, frame-to-frame motion compensation, block searching for the best motion vector match, differentiation, cosine transforming, quantizing, zigzagging, run-length coding, and Huffman coding for the P frames. And then, the B-frame processing of frame-to-frame, to frame motion compensation, block searching for the best motion vector match, differentiation, cosine transforming, quantizing, zigzagging, run-length coding, and Huffman coding.

For MPEG-2, life's not so easy. With MPEG-2 we do all the compression stuff on an individual field-to-field basis, which equates to about twice the work. So hardware-wise it takes about 15 of those nice new superchips operating with a specialized computer. Not to mention a bigger faster decoder chip.

I'm not saying MPEG-2 isn't a good thing, I'm just thinking maybe it's not for everyone. The MPEG-2 encoding computer costs about $60,000 and hooks up to a PC that stores the spot files on hard disks. The hydro-electric power plant is not included. What happens if it breaks? No problem. Just put in your spare expensive $60,000 computer box. MPEG-1 at U-matic resolution only requires one nice neat little two-superchip board, that plugs into a PC. A spare board is about $15,000. The 352 x 240 resolution is perceptibly equal to first generation U-matic

"MPEG-1 designs are in final stages of completion and already it is considered by some as obsolete. This is far from the truth."

video. If the source is Betacam the digital spot would have video elements that are better than U-matic, such as lower noise and better color.

Now think about this. You have made lots of money with your old beat-up U-matic VCRs. It has been a pain-in-ass but you've gotten by with your fifth generation tapes played for six months. Maybe having first generation quality every time and not having to fix that old VCR anymore is a big step up. Maybe MPEG-1 U-matic resolution is a big improvement to where you are now. I know MPEG-2 will be the world broadcast TV standard with great resolution and quality, but how many 1-inch Type C machines or Betacam VCRs do you have racked up for playback of your local spots? I know the broadcast station down the street uses them but guess what? Broadcasters are taking a strong look at how cable has done so well with so little.

Memory's cheap

Now if mass quantities of pixels and superchips aren't enough to worry about, you have to deal with hard disk storage. A 30-second spot compressed using MPEG-1, 352 x 240 and at a rate of 1.5 megabits per second takes up about 5 megabytes of disk space. The 1.5 megabits per second is the rate that data

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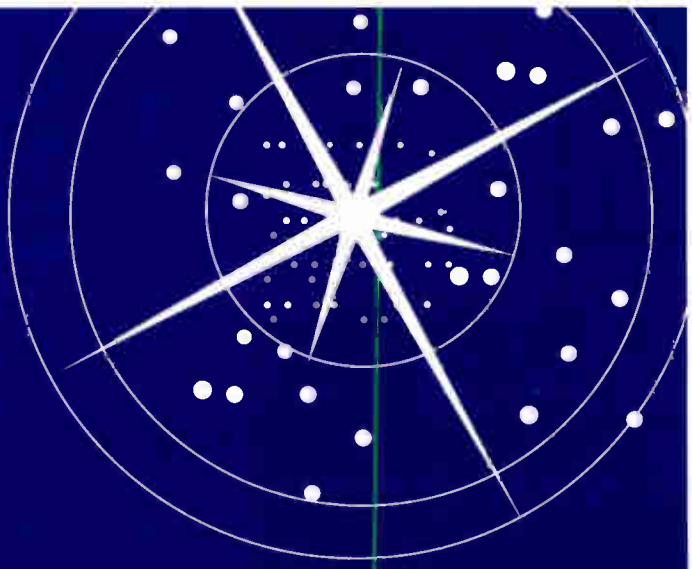

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must be pumped to a MPEG decoder card in order to reproduce the spot in an analog video format.

MPEG-1 at 704 x 480 requires 30 megabytes at a comparable 8 megabits per second rate. MPEG-2 actually takes up less space for a 30-second spot — about 25 megabytes. MPEG-2 has no improvement in file sizes for lower resolutions and most likely lower resolutions will not be supported at first release. The file sizes are not directly proportional to the bit rate. The file size depends on the complexity of the video. Spot files with much frame-to-frame redundancy will be smaller than spot files with many variations from frame-to-frame.

MPEG encoders can be manually set for a chosen bit rate. Some spots will encode great at 1.5 Mb/s and others will require 4.5 Mb/s. Moving up in resolution to 704 x 480 more than doubles the required bit rate because four times the number of pixels are being displayed. Thus to minimize digital artifacts a bit rate of from 5 Mb/s to 8 Mb/s is needed.

A typical cable local ad sales operation requires an active inventory of 300 spots per headend. These 300 spots would require 1.5 gigabytes at 5 megabytes per spot. The same 300 spots at 30 megabytes per spot would require 9 gigabytes. The list price of disk storage is about $2 per megabyte. The difference is about 7,500 megabytes or about $15,000 not to mention the hardware and computers to house and control this memory. That doesn't seem like too much in the big scheme of things.

But wait, there's more. What about memory for backup spot files in case of failure. Worst-case, double the space is required. Now we are up to $30,000. How about spare drives? What about the space required to archive these spots for later use? What about when we go to 600 spots of active inventory? Now were talking about $60,000. Now how about your five headends at $60,000 a piece? Hey no problem. Your boss can cough-up an extra $300,000.

Data transport efficiency

Now that we've beat the memory thing to death, there is another item to consider. How long does it take to send one of these mega files across town? How much does it cost to send thousands of spots. Whatever you figure out for a U-matic resolution spot file, take that amount and multiply times six for high resolution.

Most digital insertion systems must stage video prior to playback. The more of these files they need to move around, the slower the system response time especially if the spot files are large. Most systems are using Ethernet that operates a 10 megabits per second. Considering communications protocols, the effective rates are 5 to 8 Mb/s. At this rate a 30 megabyte spot could take 48 seconds to transfer. A 16-channel system would require the transfer of 96 spots per hour. Given this case, it would take 77 minutes to do the transfers. Obviously, this wouldn't work because you only have 60 minutes to do the transfers. So more expensive computer and network solutions are employed to handle higher resolution spot files.

Five megabyte, MPEG-1 U-matic resolution files take 8 seconds to transfer. Ninety-six spots can be transferred in 13 minutes. This gives you lots of time to spare. Also, it is easier to expand your system to 60 channels and not worry about capacity problems.

Walk before we run

MPEG-1 designs are in final stages of completion and already it is considered by some as obsolete. This is far from the truth.

MPEG-2 won't be deliverable for a while, possibly a year or more. When MPEG-2 products are available, they will be more expensive than MPEG-1 products. The primary benefits of MPEG-2 relate to transporting and multiplexing digital bit streams, which is not a major requirement of today's local ad insertion operations. The same picture quality can be produced with MPEG-1 as with MPEG-2. MPEG-2 spot files can be 20% smaller for some spots but at lower resolutions there is no difference. MPEG-1 is gaining momentum in the CD-ROM world. When storage is a primary concern, MPEG-1 provides the most cost-effective way to store entertainment-quality video.

The requirements for local ad insertion are acceptable picture quality, efficient storage capability and efficient transportability. These requirements become especially critical in the face of a movement to micromarketing, which could expand the channel and spot file capacities into the hundreds.

MPEG-2 has its merits and is a must for certain applications. MPEG-1 has its merits and is more efficient and cost-effective for other applications and it's here now. Most MPEG-1 digital ad insertion systems can be upgradable to MPEG-2. The cost to upgrade the playback systems should be around $2,000 per channel. The encoder upgrade is almost a total replacement at a cost of around $60,000. When evaluating a system's ability to be upgraded, pay special attention to spot file transport and memory expansion capabilities. The system under evaluation may be able to playback MPEG-2 files but the larger file sizes may exceed its operational capacity.

MPEG-2 (unless obsoleted by MPEG-3) will eventually replace MPEG-1, as new and more cost-effective chips and software are developed. So you could recommend and buy MPEG-1 today, or wait for MPEG-2 or ... **CT**

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Digital is coming to ad insertion!

By Bob Hall
President, Ad Systems Inc.

Digital is coming! Digital is coming! Not since the old movie *The Russians are Coming! The Russians are Coming!* has a single statement caused such pandemonium. Digital is coming! Digital is coming! For two years or more this statement has been ringing in every cable ad sales manager's ears. When you superimpose the implications of this new technology on reregulation issues, phone company buyouts and information superhighways, then it is perhaps understandable that this new phrase has triggered the same range of reactions that "The Russians are coming!" did in the Cold War period movie.

Planning for digital

Some operators have responded by setting forth aggressive new plans or by changing or canceling others in place. Some have seemed frozen in their tracks, postponing action until the implications became clearer. Others have kept to their knitting, preferring to keep moving and doing business as usual.

Just as in the movie, the situation became clear when one key question was asked and answered. "Why are they here and what do they want?" Similarly cool-headed cable ad sales managers are beginning to ask "How does digital video technology affect me and how do I make money with it?"

Obviously the answers to these questions are not the same for the manager of a $20 million a year interconnect as for a manager in a 20,000-subscriber system.

The manager (in either case) most likely has in place a successful ad sales operation that has been able to compete effectively with local TV stations, radio broadcasters and print media for a profitable share of the local advertising budgets.

In order to make an informed choice, each manager must access the benefits his operation provided by this new digital video technology by asking the key question: "Will an investment in digital ad insertion equipment increase my year-end profits?"

"Virtually all the billing dollar losses attributable to tape machine failure can be counted as a justification for the digital investment."

Digital video technology has been said to offer the following benefits:

1) Reduced operating costs.
2) Improved reliability (i.e., fewer missed spots).
3) Increased revenues from national spot buys.
4) New spots aired sooner.
5) Improved video quality.

For purposes of analysis, operating costs can be broken into the following general categories:

1) Amortization of the cost of the equipment involved in the operation.
2) The support labor needed to operate the system.
3) Maintenance parts and labor.

The bottom line

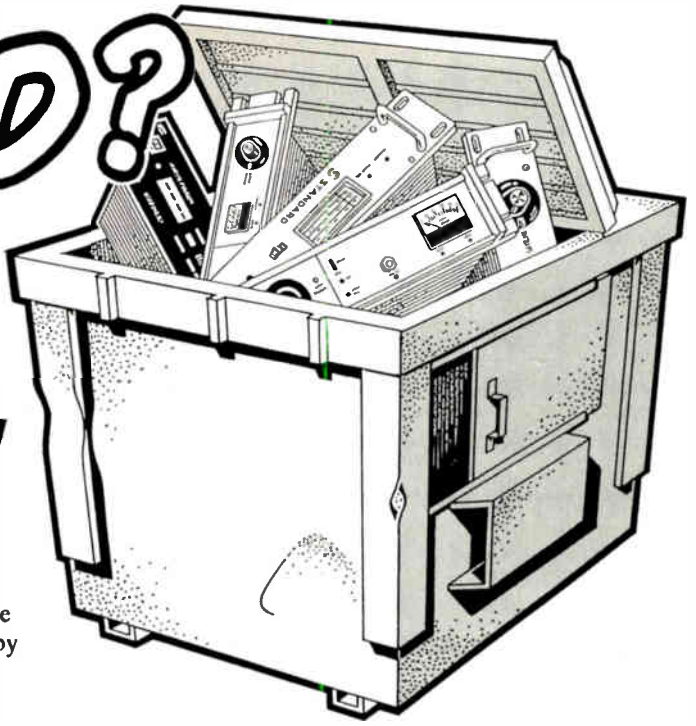
The net dollar effect of improved insertion reliability is a key element in determining the impact digital can have on overall profits. Each situation provides different savings potential. The key questions that must be asked and answered are: How much revenue are we missing because of actual equipment failure? How much because of operator error and other causes? The weak link in most insertion systems is the tape players. There is no doubt the mean time between failure of a hard disk drive far exceeds that of a videotape player. Therefore, virtually all the billing dollar losses attributable to tape machine failure can be counted as a justification for the digital investment. On the other hand, there appears to be little reason for believing human errors will be greatly reduced simply by changing to a digital-based system.

Geri Saye

The amount of support labor that can be eliminated with a digital system will vary greatly in accordance with the cable systems topography. In an operation with multiple headends separate from the ad sales office, digital technology offers certain advantages. Properly configured the system can eliminate the need to pay support personnel to bicycle insertion tapes to the headends. It also can speed up the process of airing a new spot. However, the implementation of these features may involve additional costs for such things as fiber-optic data links, microwave links or leased high-speed phone lines. Many believe this is the weakest link in the plan to fully realizing the inherent advantages digital has to offer. Without a viable solution to this problem operators can not realize the benefits of being able to quickly incorporate new or changed spots into the insertion schedule.

Another consideration that bears on the decision to invest in digital involves

OUTDATED?



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New Digital Video satellite receivers can be easily added to headends that currently have receivers using an incompatible input frequency.

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Dawn Satellite Block Translators are compact, waterproof and easily mounted inside an equipment rack. Costing a fraction of the price of a new receiver, Block Translators are an economical problem solver...

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- Eliminate "sparklies" in picture
- Prevent weather-related frequency drift
- Simplify headend wiring

OLD GENERATION RECEIVER	BLOCK TRANSLATOR FREQUENCY CONVERSION NEEDED
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Microdyne 1100DCR	In 950-1450 Mhz / Out 270-770 Mhz
Microdyne 1100LPR	In 950-1450 Mhz / Out 3.7-4.2 Ghz
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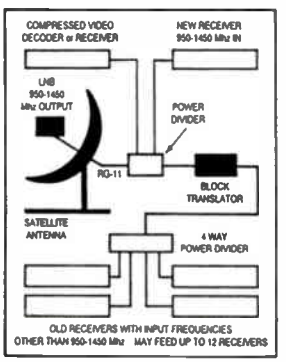

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"Digital will not make good video out of bad. Remember, it's a computer-based system and the old garbage-in, garbage-out rule applies."

an assessment of the potential revenue increase possible from national spot buys. While there is something appealing about having spots sent directly from a Madison Avenue agency to a particular group of cable operators, there is no evidence that an ad sales operation must be digital to take advantage of this revenue stream as it develops. Companies such as Sky Connect have indicated plans to deliver digitally encoded spots that will be converted to analog form at the participating headends. Perhaps more to the point, some ad sales operators have questioned the basic economics of this revenue stream. Assuming that the revenue from the sale of a prime-time spot to a national agency is less than that realized from a local contract sale already in place, some sales managers question the motivation to accept the spot buy contract. While there are potential revenues from national spot buys it is perhaps best not to rely on these as a pivotal influence in the decision to invest in digital.

The final and certainly the most visible impact of digital is improved video quality. In the highly competitive world of ad sales, cable must be able to compete head-to-head with broadcasters that are investing heavily in the latest technologies. Beta quality is the norm in most cities. Digital technology has the potential to deliver significant improvements in the on-air look of an ad sales operation. Eliminating the perception that while cable ads are effective, they are not presented with the same quality as broadcast spots, will have a profound effect on the perceived value of local avails.

As a word of caution, it must be noted that just because it's digital does not mean its better quality video. In order to produce the desired result the digital system selected must produce a significant improvement in video quality that will result in a system's ability to increase prices and/or influence ad agencies to recommend that their clients spend a larger percentage of budgets with cable.

Previously managers who started new local ad insertion programs have been able to generate additional revenues equal to their equipment investment in a matter of a few months, thus making money managers very happy. It would appear that just replacing tape-based systems with digital will not generate that degree of pay back unless installed in very large systems.

The street prices being quoted for digital systems are reported to be in the range of $10,000 to $18,000 per channel. However, these are based on systems with 12 to 16 channels. In general, the per-channel prices increase dramatically if based on fewer channels because of the cost of the real-time MPEG compressor hardware. In many cable systems the cost of moving to digital should include an upgrade of the production and editing system. Digital will not make good video out of bad. Remember, it's a computer-based system and the old garbage-in, garbage-out rule applies.

Summary

In conclusion, if you are called upon to determine whether or not digital is for you, it is important to evaluate the total impact of the change in every possible area of operation. Digital has the ability to reduce costs in some operational areas. However, it will increase cost in others. Review all the facts. Be realistic. Digital will not totally eliminate maintenance! It will not reduce missed spots to zero! It will not make bad video good! Fully implemented, it will make it easier and faster to air new spots. It has the potential to improve the on-air look of spots if the quality of production is there initially. Carefully evaluate the impact on sales volume. Determine the total investment needed. Establish an acceptable return on investment. Look at the alternatives and make your recommendation.

The Russian submariners in the movie were stuck on a sandbar and wanted nothing more than to get back to the basic business at hand. Similarly, most ad sales managers just want to understand how digital technology can help them make more money.

As in any good yarn the suspense is building and the outcome is not clear. However, the plot is thickening! **CT**

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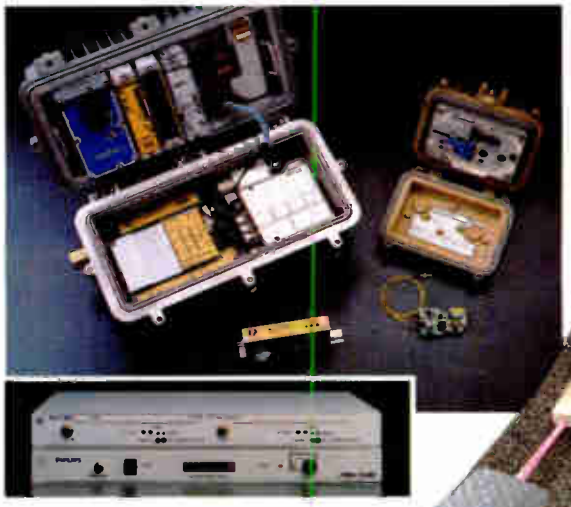

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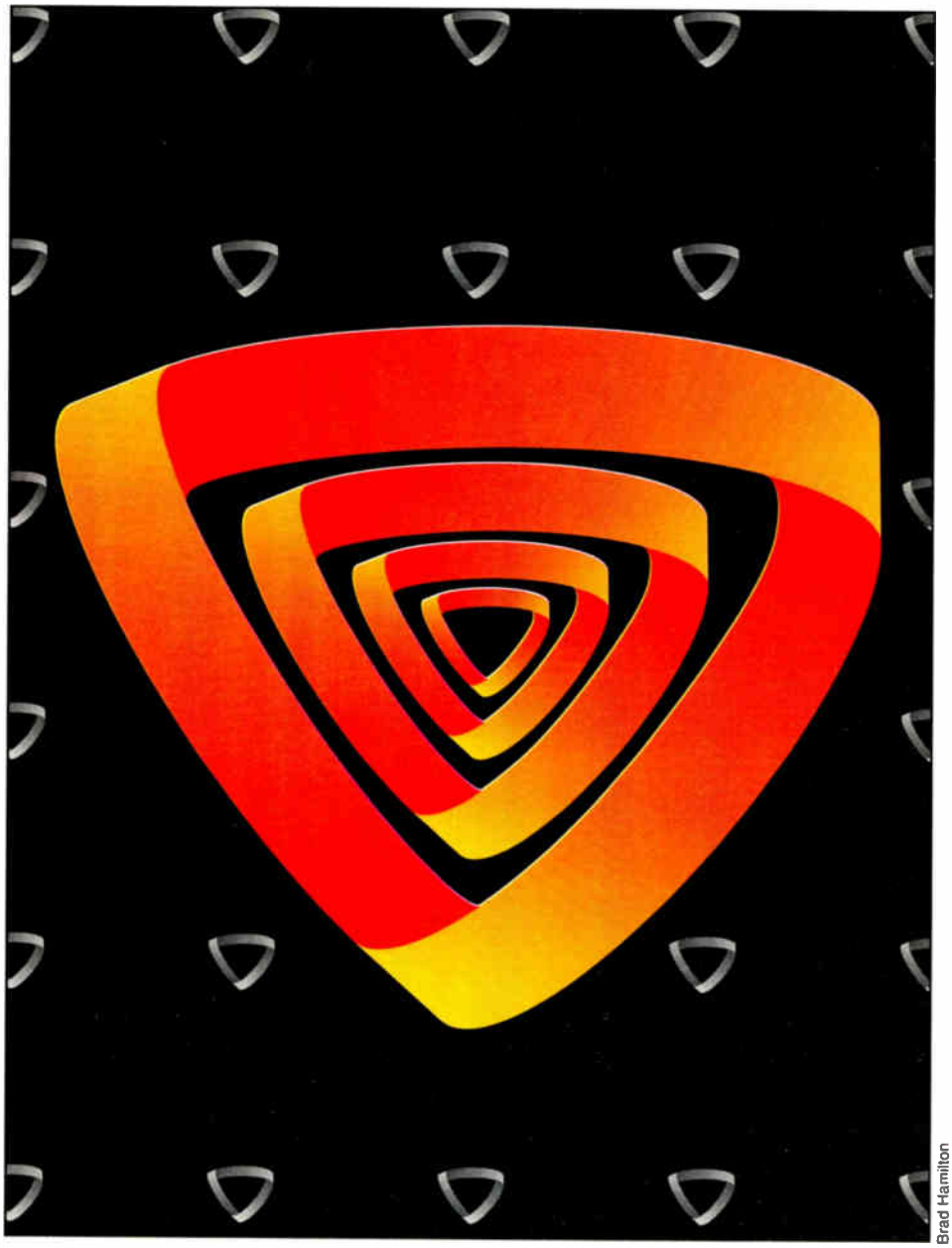
Reader Service Number 65

Building the "ubiquinetwork" — Part 2

The following is the second installment in this series on the information superhighway and what it means to operators, vendors and consumers.

By George Lawton
West Coast Correspondent



Brad Hamilton

Cable companies have been offering data networks for years — usually as part of franchise agreements with the local governments. But lately there has been a growing offering from manufacturers in what is perceived to be an enormous opportunity.

Zenith and Digital Equipment Corp. have offered data equipment for some time. Now Hughes Network Systems, Chipcom, Intel and General Instrument either have coax data products or are planning on offering them in the near future.

Although traditional I-Nets tend to be regulated, some cable companies are starting to explore the market for offering commercial services ranging from wide area networks (for large spread out companies) to high-speed Internet access. Take the case of Columbia Cable of Oregon. It has had a public network for several years that now spans 550 miles and serves 150 sites. Each site has a connection ranging from 9.6 kb/s all the way to 10 Mb/s.

"We are not making money on it, but we hope to some day by continually adding customers," explained Andy Scott, engineering services supervisor at Columbia. "We can charge a rate but it is regulated."

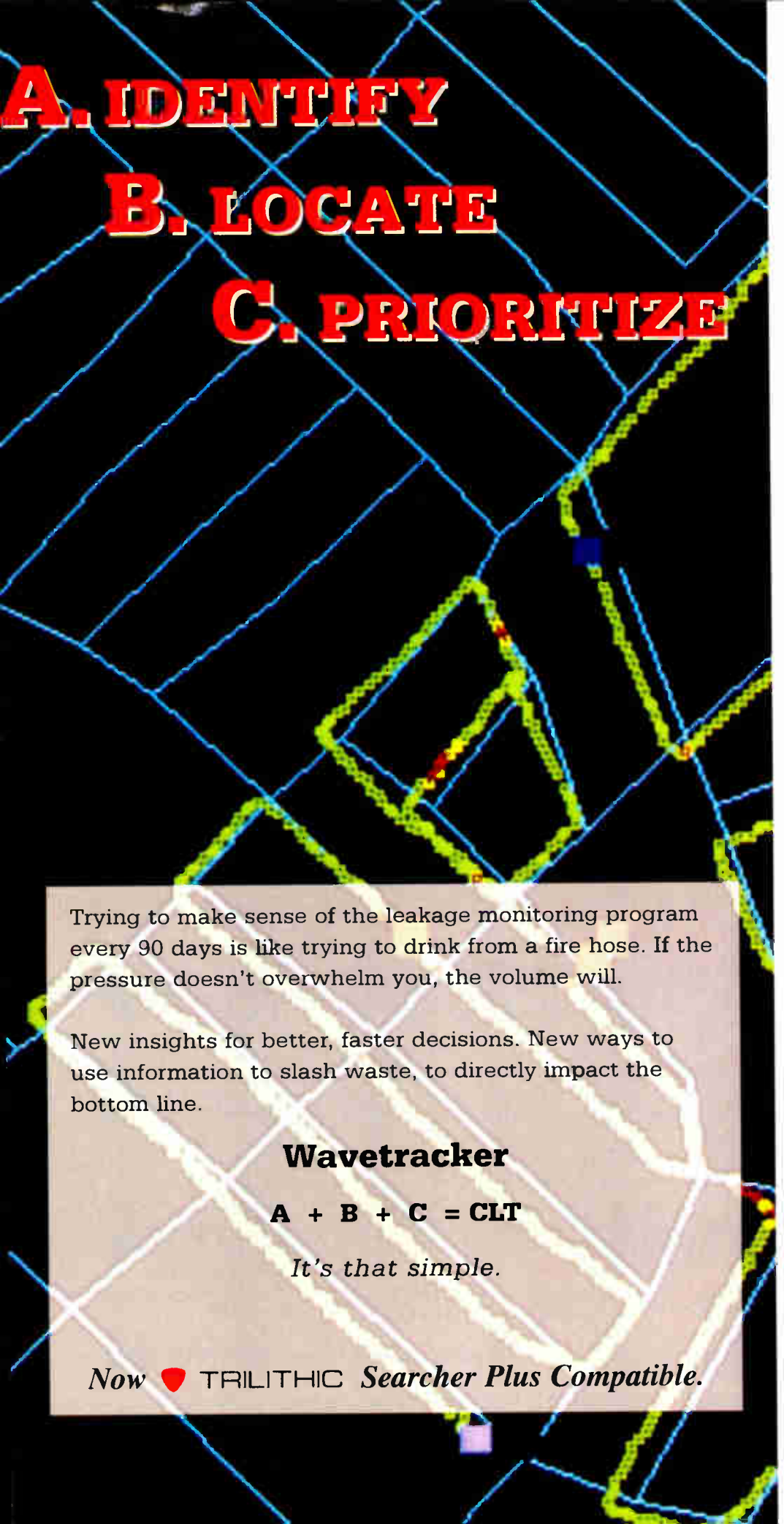
So Columbia has launched an independent network for businesses, on which it can charge profitable rates. It has already incorporated 350 miles of coax into this network, which includes only two customers so far. Both are using it to transfer data between their own facilities.

Traditionally, Columbia only provided the connections to customers, who would then attach their own equipment. But customers in the business world want end-to-end solutions. Scott explained, "We are seeing some hesitation unless we can provide more of an integrator role."

Quantifying the benefits

In Phoenix, an experiment is going on to quantify the benefits a wide area cable-based network can bring to a manufacturing community. Digital Equipment Corp., Times Mirror Cable and Arizona State University are all contributing time, equipment and money to the project. Six organizations have already been hooked up to the network, including one prime contractor (McDonnell Douglas) and two subcontractors. (See *Communications Technology*, February 1994, "News.")

The project was originally conceived in 1992 by Dan Shunk, director of the Computer Integrated Manufacturing Systems Research Center at Arizona State University. He explained, "We found that prime contractors used three criteria to evaluate the competitiveness of their suppliers — quality, cost and rapid turnaround time. In today's global marketplace, it is increasingly difficult for small and medium companies to



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compete on cost. A network that allows rapid communications among all levels of manufacturing could dramatically reduce the time-to-market and improve quality. These are significant competitive advantages for U.S. manufacturers."

The network will run on top of Times Mirror's 7,000 miles of fiber and coax in the Phoenix area. DEC will provide its ChannelWorks technology, which allows for 10 Mb/s Ethernet connectivity over a distance of up to 70 miles. In addition, DEC will provide FDDI products that enable cable systems to support voice, video and data applications at up to 100 Mb/s across a wide area.

Paul Wedeking, vice president of multimedia and interactive services for Times Mirror, said, "We wanted a third party to do a lot of the research for us because customers react well when a university takes a look at something like this. If you can document the improvements in the manufacturing process to potential customers, and show how you worked closely with contractors and subcontractors to get products to market on a more timely basis, then you have something."

In fact, Times Mirror even had to turn away 15-20 interested companies. Wedeking explained, "One of the biggest problems is that we have to limit the number of sites in the test so that we have a very solid piece of research. We are limiting the quantity of prime and subcontractors to a number that can be connected in a set period of time and get us results that are replicable across the nation."

Preliminary results indicate that videoconferencing appears to be a more useful application than its sponsors had originally envisioned. "The ability of manufacturers to see the production process and show that to their peers gives them all kinds of efficiency," said Wedeking. "You can imagine the cost for every hour the production line is down."

Advertising — unregulated revenue

Advertising stands to grow in importance as a source of revenues for cable companies thanks to the advent of digital technologies. Computer-based advertising will one day enable ads to be inserted on demand to every subscriber based on their profile.

But even before VOD emerges, digital advertising will simplify the process of reliably inserting ads on many channels simultaneously. Ron Fischmann, president of Visiontel, believes that while the industry is now collecting only $20-$30 per subscriber, digital technology will enable it to bring in $50-$60 per subscriber in the near future.

"The new breed of interactive devotee will become so enamored of his remote control air mouse that he will aggressively interact with anything and everything on the screen."

Part of the today's relatively low ad incomes result from the complexities of the analog advertising done today. Larry Zippan, corporate vice president of advertising at Time Warner, points out, "Right now everyone is in the world of analog videotape. Because of complications of building many master library tapes for analog random access systems, the average operation is only inserting commercials on about a dozen cable networks, even though their systems carry many more channels than that. The complications of our scheduling software is such that there is no return on putting ads on new channels."

Zippan is waiting for the day when digital technology will enable him to place ads on every channel that accepts them. "If you have 50 basic cable channels that accept local ads, then you should be able to put ads on all 50."

Currently getting an ad ready for broadcast is a time-consuming process that can take anywhere from a few days to a week. "You can imagine there is a whole category of advertisers (who we are hoping to do business with) who have stayed away because of these limitations," says Zippan.

In Albany, NY, Time Warner just installed a digital ad production system that enables the system to deploy a new commercial in only 20 minutes. This will enable very time-sensitive advertisers (like supermarkets) to take advantage of advertising on the cable system. It may put an ad for soft drinks on the system one day. The minute soft drinks sell out, it could call the cable company and change the sale to cereal within 20 minutes.

Time Warner is experimenting with digital ad insertion systems from four different vendors in its different systems and Zippan says that they would like to install four more. By 1995 he is planning to have moved some local ad systems completely into the digital domain.

That will bring a new level of complexity to scheduling advertisements for the system. Zippan said, "Think of inserting ads on 25 local cable systems in a market where you are broken up into 25 local trading zones. That is a 25 x 25 matrix that needs to be scheduled, presented and sold.

"I also suspect that somewhere along the line we also will need to enhance the skill set of people working in these local units. We have very talented people who know how to do what we are doing today and will have to use the tools of tomorrow. Instead of relying on printed material, local sales people are starting to understand how to make a sales presentation off of a desktop or laptop computer, which may at some point be connected to the inventory and inventory management solution."

Regional interconnects will be another key driver to cable advertising growth. In the San Francisco Bay area, for example, Bay Cable Advertising now sells and coordinates advertising on 10 channels on 26 separate cable systems. It breaks the Bay area into eight different zones and local retailers can buy one region at a time. Large advertisers also can buy large metro regions or even complete coverage. This lets advertisers place the ad in the markets they want while only having to deal with a single entity.

BCA owns and operates all of the equipment required for placing the ads. Each month, BCA gives the cable operators a check for the advertising placed on their systems.

In 1993, BCA generated $20 million in sales, more than any radio station in the Bay area and encroaching on some of the smaller TV broadcasters. But there is still room for growth. By some estimates Fox generated $100 million in sales last year in the Bay area.

Bill Stanfield, president of BCA pointed out, "You will always have the argument that if they work on their own, they would generate more for their bottom line because they could keep it all. We are at a point in growth where we have crisscrossed that line."

This is partly due to the efficiencies that a single organization can have over numerous smaller ones. If a system has

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100,000 subscribers and a single insertion site, it is a lot cheaper to build and operate than the same sized system with six insertion sites.

Also, the sum of all the local advertising may be worth more than if it were treated as one market. As Fischmann explained, "The broadcasters are exactly that, BROAD-casters. They cannot target by area.

"The advertisers want to reach a select market, but if they go to ABC, they have to buy the whole area. Advertisers who before would not buy cable are now looking at it because they can target both geographically and demographically. We will put in equipment that will allow them to zone and get down to the neighborhoods they want."

Currently, one of the problems in making a large system like BCA work is that all of the equipment must work together. There are some incompatibilities between the equipment and software produced by different vendors.

To iron out some of these problems, many of the main advertising equipment vendors met at CableLabs last November. Participants included Ad Systems, CCMS, MultiVail Engineering, DEC, Channelmatic, CCMS, Optimedia, SkyConnect, Starnet, Texscan MSI and Perfect Sync. They created a preliminary blueprint on the technical specifications required to make digital ad insertion hardware and software work together.

Taking advantage of advertising does not have to be the exclusive domain of large operators or regional interconnects. Visiontel is trying to form a business on helping small operators get into the digital age without having to spend big bucks to buy the equipment to convert ads into a digital format.

For a fee, it will take analog tapes from advertisers or cable companies and encode them into a digital format. It will then send the digital version back via satellite, compact disc or some other media. That will enable the small cable operator to take advantage of the benefits of digital ad insertion, like reliable automatic scheduling, with only a modest investment in the equipment required for actually inserting the advertising.

Inching toward VOD

True video-on-demand (VOD) will be costly for any operator to implement. In the meantime there is pay-per-view (PPV) for bringing in revenues from hit movies. But there are only so many hit movies consumers are willing to pay $4 or more to watch.

Perhaps consumers are willing to pay a smaller premium for watching a popular TV show that they missed. That was the idea that John Hendricks, chairman and CEO of Discovery Communications Inc. in Bethesda, MD, came up with after he noticed people were writing in to buy copies of popular shows that they had missed. Many were sending in as much $20 just to get a copy of them.

Figure 4: Your Choice TV

Hendricks reasoned that if a few were willing to pay $20 for these missed shows, then many more would be willing to spend less than a dollar to watch them. Your Choice TV (Figure 4) was born, which acts as a sort of low-cost PPV system for these missed shows and allows viewers to watch them up to a week after they were originally aired.

Because of the limited channel capacity of today's cable system, only the most popular shows are carried. But with the advent of digital compression, tens or even a hundred or more shows could be carried. Your Choice TV is now conducting experiments in eight markets across the states with a subscriber base of 20,000.

The boxes that will bring the future

A number of different vendors are looking at schemes for gradually acclimating consumers to the interactive technology of tomorrow. In the first phase, most of these will send out information to a box, with which the consumer interacts. Those systems that do enable the consumer to interact with the large world, tend to use the telephone as the return path.

The big set-top box manufacturers, Scientific-Atlanta, General Instrument and Zenith, are playing the field and working with multiple interactive service providers. Bill Brobst, a spokesperson at Scientific-Atlanta, explained, "We are working with a lot of them but it is hard to see who will win or lose. With these different digital box trials, they are going to be marketing a lot of services and through that we will have a bird's eye seat of what is successful and what is marketable."

Scientific-Atlanta is building its 8600 set-top terminal in a modular format that will enable customers mix and match the components they need to offer a particular set of services. S-A is busy working with Motorola, Silicon Graphics, 3DO, Interactive Network, Zing and several others to create the add-in modules.

Prevue Networks arguably has the lead in bringing electronic TV guides to the home. It currently reaches an audience of 32 million subscribers across the country through its scrolling TV listings.

Jerry Henshaw, chief technology officer at United Video Satellite, which owns Prevue Networks, said, "I think the problem now is that we have a technology waiting for a market. We feel that Prevue has started acclimating users. They see the screen and they think it would be nice to scroll the screen back. We think we are in a great position to let them buy now at a low level and then slowly migrate them up.

Prevue has started working with all of the big set-top vendors to integrate a chip into set-top boxes that will be capable of storing program listings. It is currently testing a Zenith prototype in Fairfax, VA, on a cable system run by Media General.

Prevue has merged with Trakker and is now offering a stand-alone unit that collects information via the FM subcarrier. It provides consumers with sports, weather and channel information, for about $4.95 per month.

With 32 million subscribers, Prevue has done more marketing research than any other company in this field so far. John Batson, president of Prevue Net-

works, believes that the average consumer is only willing to spend $1.50 to $2 per month at the most for an electronic program guide. He said that an automatic VCR may add another $1.50 to $2.

TV Guide Online, based in Denver, is another contender in the world of interactive program guides. It is working with Zenith, General Instrument and Scientific-Atlanta to build its version. It will enable consumers to arrange them by categories or delete unwatched ones completely.

StarSight Telecast Inc., another electronic program guide company, is working with Viacom in its famous Castro Valley project. It will enable consumers to look for programming through three modes. A grazing mode will enable subscribers to get information on programs as they are flipping through channels via a window that pops up in the middle of the screen.

A browsing mode enables watchers to look for programming based on theme. A grid enables people get the full TV guide. The system even has a VCR interface. This enables a consumer to program the VCR, by highlighting a show in the grid guide, and pushing the appropriate button.

The system is being built into TV sets, VCRs and cable decoder boxes by half a dozen different manufacturers, including Philips, Samsung, Uniden America Corp. and Zenith. The programming information will be delivered via the vertical blanking interval on the PBS network.

Interactivity will not just provide programming guides, it is enabling people to play games along with television, shop and even gamble. Interactive Networks based in Mountain View, CA, has developed a wireless unit that lets consumers play along with television, and even play competitively for prizes. Charter members pay $15 a month just to play and for $25 a month they can compete for prizes.

The service has been running in San Francisco and Sacramento for over a year. Last September it launched a national rollout beginning with Chicago. It is expected to be available in 10 markets by April, with full national coverage by September 1994.

Interactive Networks is currently producing interactive programming for NBC, Fox, CBS, ABC, USA, ESPN, PBS and TNT. In its areas of coverage, a digital signal is sent via an FM subcarrier that supports 75-80 hours of interac-

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Reader Service Number 40

tive programming every day. To record their scores, callers plug the unit into a telephone jack and it uploads their answers to a polling unit.

Interactive Systems, in Beaverton, OR, is planning on offering a similar service using a different technology that modulates information onto a TV signal by modulating the luminance on a line-by-line basis. It is capable of placing up to 2.4 kb/s onto a channel without adversely affecting the quality. Like the Interactive Network box, the system has a built-in modem that lets people send their scores out via a telephone call.

Interactive Systems' device has been in operation in Europe since January 1993, where it offers consumers the chance to play along with their favorite TV programs. The Europeans would have considerable resistance to full blown interactivity like home shopping and VOD, argues Craig Kelly, director of operations at Interactive Systems. "People are not ready to make that big leap. You need to wean the consumer slowly."

Over in Australia, Interactive Networks recently won a license to offer off-track betting and home-based lottery services. Kelly said, "Gambling could become the biggest application so far."

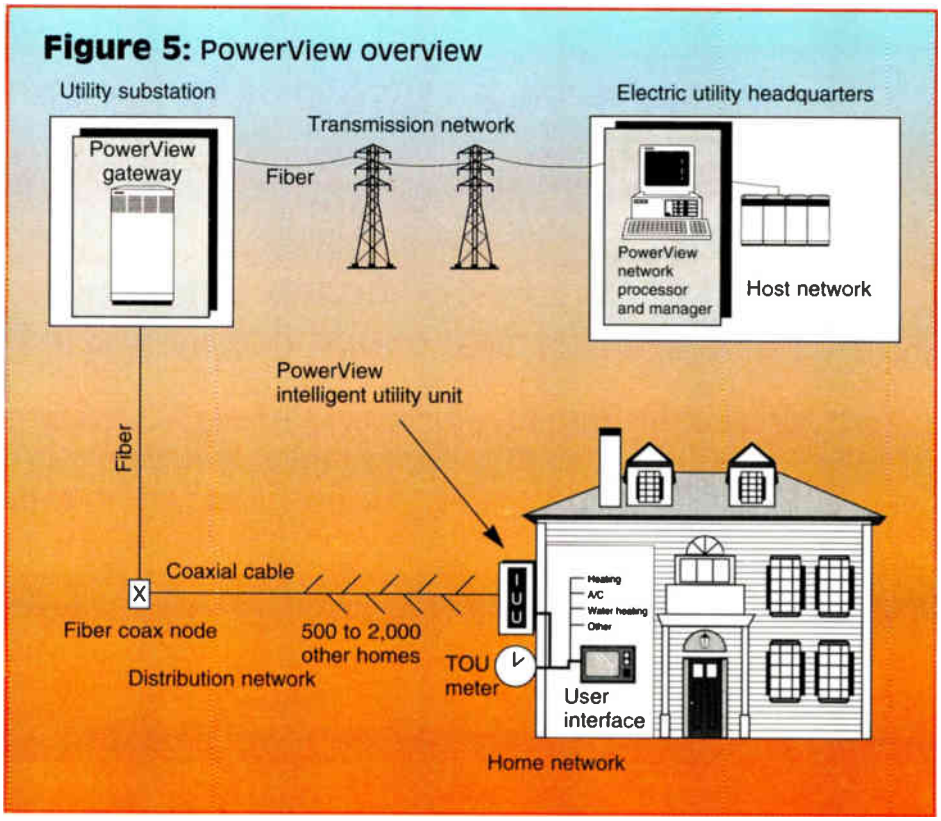
However, as soon as you start enabling people to make money, you have to guard against the possibility of fraud. Kelly said, "No matter what you do, someone will try and cheat the system. Whenever you play games, you have to set strict parameters that make it difficult for someone to cheat."

The hand-held unit built by Interactive Networks has built-in timing capabilities, which will enable it to detect when someone has run the unit off of a time delayed tape.

Kelly believes that the market will open for off-track betting here in the United States as well. However, it will take time because one would have to go through a regulatory process in each state.

Each of these interactive devices is limited in the types of services that can be offered. This is partly because of the technology and partly because the cost of the equipment for creating new services is fairly expensive.

Figure 5: PowerView overview



Building new services on an open platform

The 3DO Co., based in San Mateo, CA, is working on an open development system that will enable developers to create applications once, which can then be run on a variety of different systems. Although the original target platform was a CD-based video game system, it is working with US West on its Omaha, NE, project to create a set-top box capable of running client/server software across a multimedia network.

It has designed a chip set for supporting high-speed graphics and the tools for developing applications that run on this chip set. These development tools run on a standard PC or Macintosh environment, making it easy for developers to write applications at a low cost. Over 500 applications are currently in the works.

3DO has no plans to manufacture any of the game machines or set-top boxes itself. Instead, it is relaying on traditional manufacturers like Panasonic, Matushita and Scientific-Atlanta to produce these boxes.

Rick Tompane, chief technology officer at 3DO, said that some of the applications will be downloaded and played by the end user. "Then there will be those taking advantage of the fact that it is a network and they will run an application that is constantly streaming off a server. One of the nice things about the network is that the data rate can be as high as 27 Mb/s. But most applications will go at the CD rate or slower.

The game channel

Of course, not every cable network can support the interactivity required by 3DO's box today. The Sega Channel is hoping to create a market through a cable-based delivery system of video games. Players will be able to download games into a special cartridge that plugs into a Sega game system.

This month the Sega Channel is set to begin a market test of the service to test pricing and consumer demand. During the trial, consumer will pay from $12.95 to $19.95 for the chance to play up to about 60 different games.

The games are modulated onto a 6 MHz channel and broadcast via a national uplink facility. Cable TV headends insert the channel like any other program. A computer also is required for addressing the active game units. Joe Napoli, an engineer with Sega, said that headend costs for offering the service will be $4,000-$8,000.

One wonders if this service will go the way of the Nabu Network nearly a decade ago. This was an attempt to deliver video games via a special set-top box. Eventually, it was to support multiplayer games via the cable system. But that died after a year or so. But then again, Sega already has a significant market penetration and Sega Channel executives are anticipating a buy rate of 2%.

Energy management

Electric companies may be one of the key drivers of interactive networks. By some estimates, they could actually

CCTA
National award winner for
"Outstanding achievement in Engineering"

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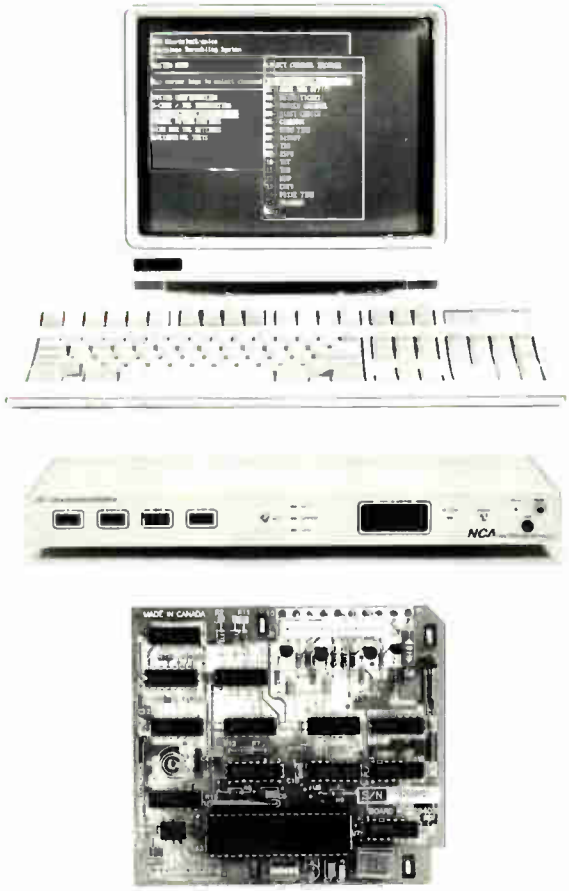
PAY TV THEFT & INCREASE YOUR REVENUES

NEW!



LOW COST

CHAMELEON

Addressable Pay TV Scrambling System

Chameleon uses digital encryption and locked microprocessor technology to create a new, secure, cost effective, Addressable Pay T.V. System. The Chameleon was developed by a cable company to stop the theft of pay TV signals in their own systems. In the development of the Chameleon they added 100 tier levels, PPV options, Preview options and much more. If you suspect you might have a theft problem with your existing equipment, would like to upgrade to a more secure system or don't presently have an addressable system, contact one of the agents listed below for more information.

See us at Booth #147 at SCTE

Agents

The Cable Shoppe
Albany, New York
(518) 489-2100

TeleComm Resources
Oakley, CA. 94561
(510) 625-1767

Manufactured by:

NCA Microelectronics
(a division of The Fundy Cable Group)

Phone: (506) 634-0000
FAX: (506) 634-5135

Agents

Cable Products
Lawrenceville, GA.
(800) 533-9723

Coast CATV Supply Inc.
Corona, CA.
(909) 272-2360

Reader Service Number 33

save money if they were to build an interactive network capable of supporting real-time transaction processing to every home and office. PG&E, TCI and Microsoft have announced plans to conduct a trial of energy management in Walnut Creek, CA.

Another power company, Entergy Corp., based in Little Rock, AR, has already started beta testing a fiber/coax network in Chenal Valley, AR. It is using equipment from Sunnyvale, CA, based First Pacific Networks. Entergy is planning to expand the test to 442,000 homes in the middle of 1994.

Mike Niggly, vice president of customer service for Entergy in Louisiana, estimates that this power management application, called PowerView (Figure 5 on page 40), will save Entergy 1.5 times the cost of deploying the broadband network. Not only that, but the application only consumes a small fraction of the network's bandwidth, leaving plenty of room for telephone companies, cable TV operators and eventually personal communications services (PCS) providers.

The key to PowerView's cost savings lie in its ability to obviate the need for building new electrical systems to handle peak demand. Without distributing the demand for power, it could cost $400 million to $1 billion to build generators, which would sit idle most of the time.

The power companies are in the same position the telephone companies were 20 years ago. At certain peak hours their electrical network is loaded to the max. The telephone companies got around this by charging more during peak usage times. This redistributed the load of calling, enabling the telephone companies to handle more traffic without enhancing the network.

The same strategy will be used to encourage consumers to use electricity when the cost is down. Entergy's 442,000 initial participants could begin a market for intelligent appliances like air conditioners, dryers and hot water heaters. These appliances could be programmed by consumers to only turn on if the price is right.

PowerView will give Entergy the ability to treat electricity like a commodity on the open market. When the load gets too high, the price goes up a notch. Thousands of air conditioners might immediately shut off, reducing the load. If there were still too much electricity being consumed, the price would go up another notch, until the electrical supply exceeded demand. They are calling this approach demand-side management.

"If the infrastructure makes it cheap enough for hundreds of entrepreneurs to launch their vision of the ideal service, then perhaps a few will really succeed."

The network will improve Entergy's ability to get information to consumer about consumption habits, which Niggly said could reduce total usage by 2-5%. Tests have indicated that once consumers are aware how much they are using electricity, they become more efficient in its usage.

Entergy has experimented with other techniques for demand-side management, but only a fiber-optic network could give them the control they needed. Already 100,000 homes are hooked up to a radio system that shuts off their air conditioner for 15 minutes an hour during peak loads. The problem is that many unscrupulous customers put metal buckets over the receivers that block out the signal to shut the air conditioner off. But they still receive the discount.

Entergy also explored using ISDN to deploy this system. But they would not have gotten anywhere near the real-time flexibility of the system offered by FPN. ISDN would have required eight hours just to address every subscriber, making it totally useless for the real-time control and response that Entergy required.

Entergy may be on to something big. According Steven Rivkin, an analyst at the Progressive Policy Institute, "For cutting electrical costs, you can take everything else from wrapping water heaters to automatic thermostats, but adding telecommunications is the most cost-effective thing you can do. I believe that power companies have been aware of it, but they had no confidence of telephone companies or cable companies helping them out."

Hype becomes reality?

Despite the dismal failures of so many interactive services in the past, the technology (and more importantly the audience) may finally be ready for them. Gary Arlen calls this crowd the "mouse potatoes."

At the last Society of Cable Television Engineers Emerging Technologies Conference Arlen said, "The idea is that unlike the lethargic couch potatoes, the new breed of interactive devotee will become so enamored of his remote control air mouse that he will aggressively interact with anything and everything on the screen."

In a recent study conducted of homes with $35,000 or higher annual income, Arlen found that 26% of prospective customers are very interested and another 40% are somewhat interested in using advanced interactive systems.

In the end, the ultimate judge of all these services will be the marketplace. But if the infrastructure makes it cheap enough for hundreds of entrepreneurs to launch their vision of the ideal service, then perhaps a few will really succeed. **CT**

For more information

Contact the following for more details on issues covered in both Parts 1 and 2 of this article:

- Cross Industry Working Team: (703) 620-8990
- EON: (703) 715-8606
- First Pacific Networks: (800) 544-4959
- Gigahertz Equipment Corp.: (602) 465-7830
- Interactive Network: (415) 960-1000
- Interactive Systems: (503) 627-0149
- Interaxx: (305) 893-9911
- Internet Multicasting Service: (202) 968-1052
- Internet Talk Radio: Send an email to info@radio.com.
- The Internet fax experiment: Send an email tpc-faq@town.hall.org
- Prevue Networks: (800) 447-7388
- Sega Channel: (212) 974-0112
- StarSight: (510) 657-9620
- TV Guide Online: (303) 267-6804
- Visiontel: (914) 238-5416
- Wireless Cable Association: (202) 452-7823
- Your Choice TV: (301) 986-1999

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For CLI compliance, the **Searcher Plus** offers the best value in leakage measurement instrumentation. With more than ten thousand in daily use in systems throughout the world, the **Searcher Plus** has earned its place as the industry's most popular CLI instrument.

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When used with a **Trilithic AFS-2** antenna, the **Searcher Plus** displays calibrated leakage measurements down to 2 microvolts per meter on a large, easy-to-read meter.

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Indianapolis, IN 46236
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(800) 344-2412
FAX (317) 895-3613

Reader Service Number 45.

The universal communications system of the future: Telephone or cable TV?

The following is updated from the "1993 National Cable Television Association Technical Papers."

By Paul Baran
Chairman, COM21 Inc.

Can cable TV become the universal communications platform of the future and even supplant the twisted-pair telephone loop system?

Today's cable systems are undergoing rapid evolutionary change. To better visualize where the technology is going, let's briefly review the past and then consider the present to provide a context to consider the future.

Cable started life as an extension to a TV antenna 40 years ago, delivering a couple of local TV broadcast stations to those unable to obtain a workable antenna site.

Television was then characterized by Newton Minnow, chairman of the Federal Communications Commission, as a vast wasteland — three mass audience networks, each seeking the lowest common denominator of intelligence.

As recently as 20 years ago, cable's future didn't look bright. This outlook changed dramatically with a single technological innovation. That is, using satellites to deliver premium programming to each cable headend. For the first time, urban areas could justify cable to obtain access from satellites to new programming not available over-the-air from broadcast stations. This led to a period where the cable operators fought for urban franchises, each promising to deliver more nonexisting services relative to the competition in order to win the big city franchises.

In parallel, the cable industry developed the political muscle to pull off the Cable Act of 1984, which absolved it from having to fulfill the more outrageous promises made during the franchising frenzy. Over time, in an era of minimum regulation of cable TV, the growth of systems increased dramatically. (See Figure 1.)

The cable TV industry can be rightfully proud of the tremendously increased diversity of programming it has brought to the nation. I rarely watch the three over-the-air networks. Rather, it is C-SPAN, A&E, The Discovery Channel, The Learning Channel and a few PBS stations that get my attention. As the number of program channels has increased, so has the diversity of the audience and the wider the range of programming that became feasible. And this trend is just beginning. The dramatic increase in the number of channels that can be delivered using the latest technology is but one dimension of the coming changes.

The passage of the 1992 Cable Act represents a coming of age as Congress recognizes the importance of this new and growing industry and as an important monopoly subject to rate regulation. Of course, the cable industry tends to view it as our government's proclivity to punish success and reward failure. But then there are many ways to look at the same situation.

Since the industry is being considered as a monopoly, it is fun to think of it in terms of the old board game Monopoly.

As you'll remember, when you played Monopoly, you acquired properties on the roll of the dice. Then after all the properties are divided, you'd swap properties with the other players. For example, when you hold all the yellow titles you create a monopoly position that allows you to double the rents the other players had to pay you if they were unlucky enough to land on your property. As the game continued, you saved up enough money to build little green houses on the properties, increasing

Figure 1: Growth of cable

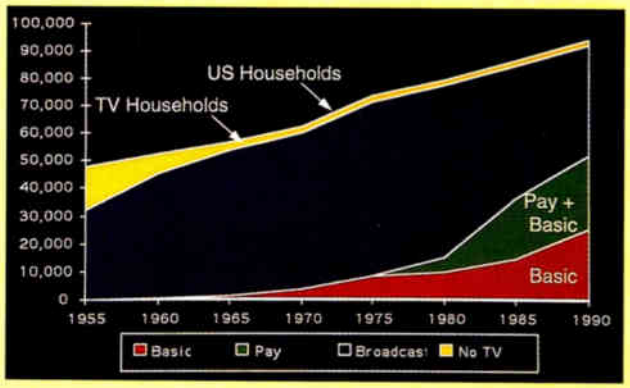
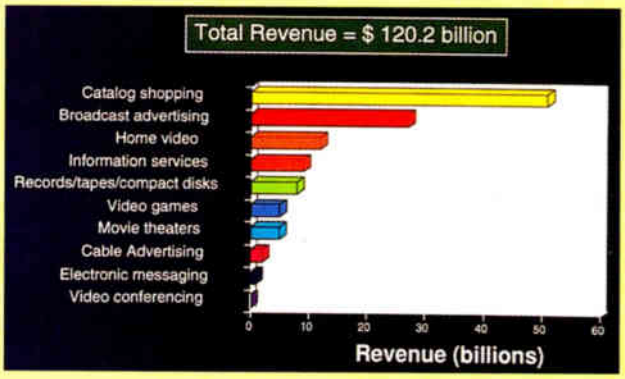


Figure 2: Interactive opportunities



The Society of Cable Television Engineers Presents

SCTE®

CABLE-TEC EXPO® '94

CERVANTES CONVENTION CENTER
ST. LOUIS, MISSOURI
JUNE 15-18, 1994

REGISTRATION PACKAGE

1969-1994 SCTE® 25 YEARS OF SERVICE

DATES

Annual Engineering Conference, June 15, 1994
Technical Workshops, June 16-17, 1994
Exhibits and Certification Testing, June 16-18, 1994

LOCATION

Cervantes Convention Center
St. Louis, Missouri

HISTORY

Cable-Tec Expo® '94 is the twelfth annual convention/trade show sponsored by the Society of Cable Television Engineers Inc. The show has proven to deliver the latest information on technological advancements and applications in a format which allows hands-on training through technical workshops and instructional hardware exhibits. The Annual Engineering Conference will be SCTE's eighteenth yearly conference dedicated to current engineering issues, FCC compliance, technical management and issues focusing on cable and telephone as converging industries. 1994 marks the 25th anniversary of the Society as a leader in technical training for the Broadband Communications industry, with this year's Expo offering additional opportunities for exposure to the newest trends in the expanding telecommunications arena.

ATTENDANCE

Attendance is open to individuals within the CATV industry as well as those involved in broadband and telecommunications who wish to capitalize on the opportunity to learn about the latest industry developments. Over 2,500 registered attendees are expected from all levels of cable television, telco and related businesses, including all levels of non-technical personnel.

PROGRAM

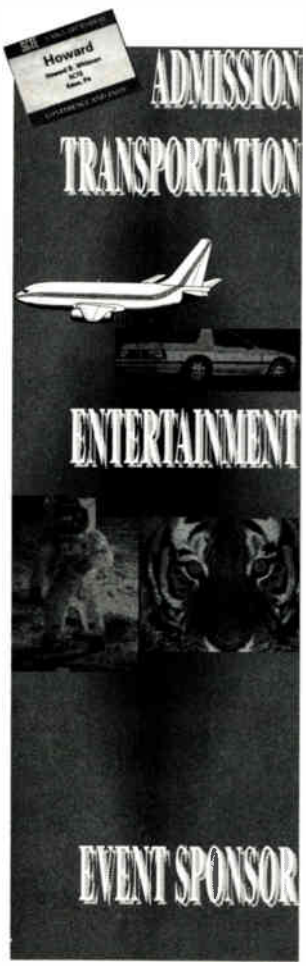
The Annual Engineering Conference consists of six hours of technical papers including issues concentrating on FCC regulations and the convergence of cable, telco and data services. Speakers will include many of the industry's engineering leaders. The annual membership meeting, held at the conclusion of the conference, will afford attendees the opportunity to meet with members of SCTE's national Board of Directors.

Following the conference, the two-and-one-half day Cable-Tec Expo® is comprised of practical workshops offering interactive technical training combined with hardware displays on the exhibit floor. The workshops, technical in nature, feature presentations dealing with the proper operation and maintenance of CATV systems, plus effective methods for training industry personnel. No other activities are scheduled during these sessions in order to guarantee maximum attendance and participation.

As with all SCTE activities, the main purpose of Cable-Tec Expo® '94 is to provide the maximum amount of training opportunities for the lowest possible cost. The event has been coordinated to fulfill this purpose, as it offers a wide variety of informative, up-to-date technical training programs. Additionally, Expo '94 will give attendees the opportunity to prepare for and participate in the Society's Broadband Communications Technician/Engineer (BCT/E) and Installer Certification Programs, gaining valuable knowledge and practical skills in the process.

EXHIBITS

The exhibit floor has a focus on education, with many industry suppliers presenting live technical demonstrations of their products. Over 250 hardware exhibitors are expected to reserve space on the Expo '94 Exhibit Floor. Exhibits will include all types of products, supplies, services and equipment used in the design, construction, installation, repair, maintenance and operation of broadband telecommunications systems. The exhibit floor will also feature a Technical Training Center for further equipment demonstrations.



ADMISSION

Admission to all events will be through color coded badges to be picked up at the registration desk upon arrival.

TRANSPORTATION

SCTE has designated TWA as the Expo's official air travel carrier. Avis Car Rentals is offering special rates to attendees (see information below). Transportation from the St. Louis Airport to your hotel can be economically arranged through Airport Shuttle Express, with booths located near the baggage claim area.

TWA Airlines: 1(800)325-4933 (U.S. only)—Refer to #V13605

Avis: 1(800)331-1600—Refer to Meeting #B821505

ENTERTAINMENT

Most Expo '94 hotels feature a tour desk with brochures covering area attractions, dining, nightlife and sightseeing activities. The discounted hotel rates are in effect for Expo attendees wishing to stay in St. Louis for three days before or after the conference.

St. Louis Area Attractions

- St. Louis Zoo
- St. Louis Science Center
- Anheiser Busch Brewery Tour
- Mississippi Riverboat Gambling
- Busch Stadium (Home of the St. Louis Cardinals)
- Forest Park (Site of the 1904 World's Fair)
- Six Flags Theme Park
- Laclede's Landing (Jazz Clubs and Fine Dining)
- Fairmount Park Horse Race Track

EVENT SPONSOR

SCTE®

Society of Cable Television Engineers Inc.
669 Exton Commons, Exton, PA 19341
(610) 363-6888; (800) 542-5040; FAX: (610) 363-5898

PRELIMINARY PROGRAM

Engineering Conference

SESSION A: ***Regulation and the Cable Industry*** with Steve Ross, ESQ., Ross and Hardies, (SCTE "Of Counsel") (moderator); Wendell Bailey, NCTA; Dave Large, Intermedia Partners; Helena Mitchell, FCC; Alan Stillwell, FCC; and John Wong, FCC.

SESSION B: ***Advances in System Architectures*** with Jim Ludington, Time Warner Cable (moderator); J.R. Anderson, ANTEC; Don Gall, Time Warner Cable; John Mattson, Northern Telecom; Karl Poirier, Triple Crown; and Doug Wolfe, Corning.

SESSION C: ***Digital Transmission Techniques*** with Tom Elliot, TCI (moderator); Dr. Guy Beakley, Stellacom; David Beddow, TCI; and Tony Filanowski, Jerrold.

SESSION D: ***Convergence*** with Larry Lehman, Brooks Telecommunications (moderator); Carl McGrath, AT&T; Chuck Merk, Philips Broadband; and Andy Paff, ONI.

Expo Workshops

★ ***Addressability and Two-Way Systems*** with John Cochran, Scientific-Atlanta; and Jim Toy, Jerrold.

★ ***Advances in System Powering*** with Gary Batson, Power Guard; and Don Sorenson, Alpha Technologies.

★ ***Basics of Digital Compression and Transmission*** with Brian James, CableLabs; and John Vartanian, HBO.

★ ***CLI, Now and Tomorrow*** with Bruce Breeman,Cablevision; Robert V.C. Dickinson, Dovetail; and Ken Eckenruth, CLT.

★ ***Fault Locating in Fiber Optic and Coaxial Cables*** with Duff Campbell, Riser-Bond and Charlie Mogray, Comm/Scope.

★ ***Fiber Installation and Testing*** with John O'Hare, Corning; and Gary Harvey, Siecor.

★ ***Meeting Tomorrow's Technical Training Needs*** with Bill Nash, TCI; Marvin Nelson, SCTE; and Pam Nobles, Jones Intercable.

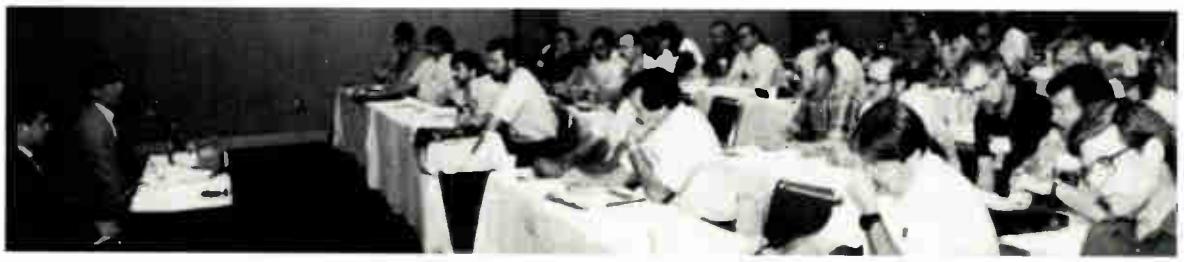
★ ***OSHA Regulations and Safety Training*** with Ralph Haimowitz, SCTE; and an Inspector from OSHA.

★ ***One-on-One with the FCC*** with Michael Lance and John Wong, FCC Cable Services Bureau.

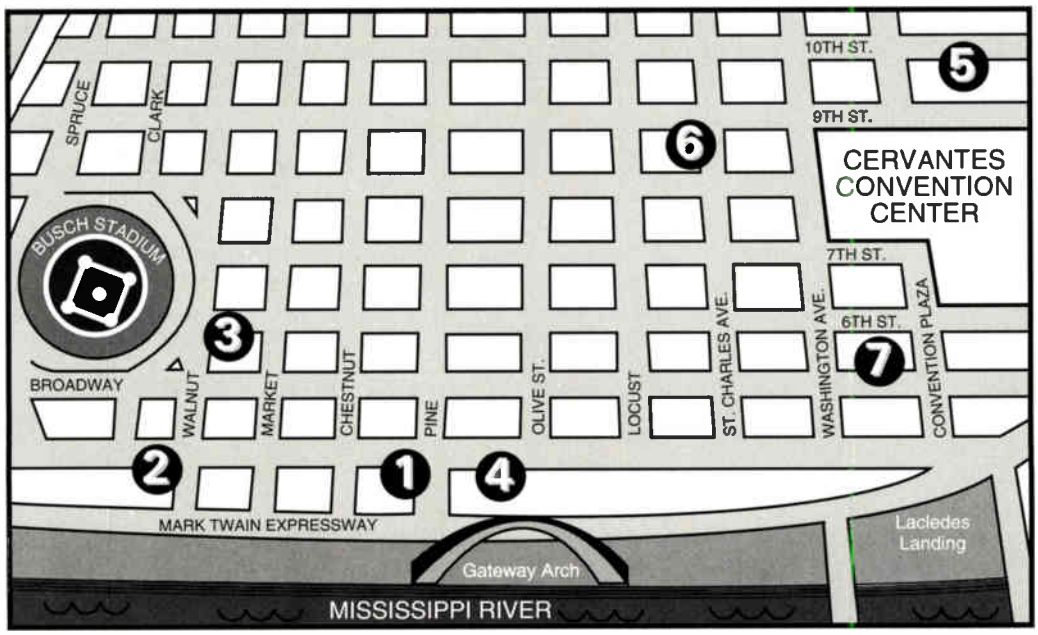
★ ***Proof-of-Performance Measurements*** with John Cecil, Hewlett-Packard and Steve Windle, Wavetek.

CABLE-TEC EXPO® '94 SCHEDULE OF EVENTS

	Registration	Training	Exhibits	Testing	Special Events
Tuesday, June 14	Attendee Registration 2 - 8 p.m.				NCTA Engineering Committee Meeting 9 a.m. - 5 p.m. SCTE Engineering Subcommittee Meetings 2 - 5 p.m. Arrival Night Reception 6 - 8 p.m.
Wednesday, June 15	Attendee Registration 7:30 a.m. - 4 p.m.	Engineering Conference 8:30 a.m. - 4:30 p.m.			Awards Luncheon 12 noon - 1:30 p.m. SCTE Annual Membership Meeting 4:30 - 5:30 p.m. Welcome Reception and Cable-Tec Games 6 - 8 p.m.
Thursday, June 16	Attendee Registration 7:30 a.m. - 3 p.m.	Expo Workshops 8 a.m. - 12:15 p.m.	Exhibit Hall Open 12 noon - 6 p.m.	BCT/E and Installer Certification Testing 10 a.m. - 2 p.m.	Ham Radio Operators' Reception 6 - 8 p.m. International Good Neighbor Reception 6 - 8 p.m.
Friday, June 17	Attendee Registration 7:30 a.m. - 3 p.m.	Expo Workshops 8 a.m. - 12:15 p.m.	Exhibit Hall Open 12 noon - 6 p.m.	BCT/E and Installer Certification Testing 10 a.m. - 2 p.m.	Expo Evening (1904 World's Fair Theme Party) 6 - 9 p.m
Saturday, June 18	Attendee Registration 8:30 a.m. - 11 a.m.		Exhibit Hall Open 9 a.m. - 12 noon	BCT/E and Installer Certification Testing 9 a.m. - 12 noon	Continental Breakfast (On the Exhibit Floor) 9 - 10 a.m. Golf Tournament 1 - 7 p.m.



HOUSING



	Hotel	Room Rate	# of Rooms Available
1	Adams Mark Hotel	$112/S, $125/D	700
2	Regal Riverfront Hotel	$74 S/D	500
3	Marriott Pavilion Downtown	$99/S, $109/D	350
4	Holiday Inn Riverfront	$73/S, $83/D	300
5	Holiday Inn Convention Center	$77/S, $87/D	250
6	Doubletree/Mayfair Suites	$105 S/D	100
7	Drury Inn—Gateway Arch	$87 S/D/T/Q	100

Credit cards only may be used to guarantee hotel rooms.

Adams Mark Hotel (Headquarters)—Adjacent to the Gateway Arch, the Adams Mark is a luxury hotel featuring two restaurants, four lounges, indoor and outdoor swimming pools and a health club.

Regal Riverfront Hotel—Located on the Mississippi River, both towers were recently renovated. The Regal features a revolving rooftop restaurant, indoor and outdoor swimming pools, a deli and two lounges.

Marriott Pavilion Downtown—Adjacent to Busch Stadium, the Marriott features two restaurants, sports bar, indoor swimming pool and health club in two 22-story towers.

Holiday Inn—Riverfront—Located across from the Gateway Arch, the Holiday Inn is a renovated 29 story apartment building with spacious guest rooms, restaurant, deli, lounge and a rooftop pool.

Holiday Inn Convention Center—Located adjacent to the Convention Center, the hotel features a five-story atrium with indoor pool, exercise room, two restaurants and a lounge.

Doubletree/Mayfair Suites—One block from the Convention Center, the Mayfair is one of the city's historical landmarks. The all-suite hotel features two restaurants, health club and a rooftop pool.

Drury Inn - Gateway Arch—One block from the Convention Center, the Drury features an indoor pool and offers complimentary breakfast and parking. The rate applies to up to four persons sharing a room.

INSTRUCTIONS

1. **Deadline:** Cable-Tec Expo® '94 Registration Forms must be received by SCTE National Headquarters on or before May 13,1994. Forms received after that date will not be processed. If you do not preregister for the Cable-Tec Expo in advance, you must register on-site in St. Louis.
   - ❊ Use a separate form for each individual (forms may be copied).
   - ❊ Appropriate registration and activity fees must be enclosed for this form to be processed.
   - ❊ Hotel reservations must be made using the enclosed Attendee Housing Form before May 13, 1994.
2. **Registration Cancellations:** All cancellations must be received in writing by SCTE National Headquarters on or before May 27,1994. A $50 cancellation charge is applicable to all registrations cancelled after May 13,1994. Substitutions will be accepted until May 27, 1994. **NO REFUNDS WILL BE GRANTED AFTER MAY 27,1994.**
3. Telephone requests for cancellations and substitutions will not be accepted. All requests for cancellations must be submitted in writing and be received before May 27,1994 and all requests for substitutions must be received before May 27,1994. (SCTE FAX #: 610-363-5898)
4. Return the Cable-Tec Expo® 1994 Registration Form with the appropriate fees or credit card information to:

   SCTE
   Attention: Anna M. Riker
   669 Exton Commons
   Exton, PA 19341

   Only registration forms with credit card payment will be accepted by fax. Date of receipt will determine registration fee charged.
5. Please make flight reservations directly through TWA Airlines or your local travel agent using the special number listed on the "Registration Fees" page. Rental car reservations may be made through Avis.
6. Please use the enclosed Attendee Housing Form to make hotel reservations in St. Louis. Indicate your first, second and third choices of hotel. Confirmation of your housing reservation will come directly to you from the appropriate hotel. Hotels are assigned first come-first served based on availability. Credit cards only may be used to guarantee hotel rooms. Do not send hotel deposits to SCTE.
7. **EXPO '94 DRESS CODE:** Since the primary purpose of the Expo is education, we urge you to dress in a manner that is comfortable and conducive to your getting the most out of the program. (slacks, jeans, short sleeve shirts—**NO shorts or tank tops**).

PLEASE NOTE DEADLINES

MEMBERSHIP APPLICATION

Make check payable to SCTE.

Mail To: SCTE
669 Exton Commons
Exton, PA 19341
FAX: (610) 363-5898

❑ I hereby apply for membership in the Society of Cable Television Engineers, Inc., and agree to abide by its bylaws. Additional member material will be mailed to me within 45 days. Payment in U.S. funds is enclosed. I understand dues are billed annually.

❑ Please send me further information on the Society of Cable Television Engineers

SCTE is a 501 (c) (6) non-profit professional membership organization. Your dues may be tax deductible. Consult your local IRS office or your tax advisor.

APPLYING FOR: ❑ INDIVIDUAL @ $40 ❑ SUSTAINING @ $250
Please print or type information. Data will be used exactly as it is submitted here.

❑ MR. ❑ MRS. ❑ MS. TITLE:_____

NAME:_____ TEL.#:_____
First Initial Last Area Code/Number

EMPLOYER:_____ FAX #:_____
Company Name Area Code/Number

CO. ADDRESS:_____
Street/P.O. Box

_____
City State ZIP

USE HOME ADDRESS ?: _____
Street/P.O. Box

_____
City State ZIP

YOUR SIGNATURE:_____ DATE:_____

Complete the information. Enclose full payment or charge to MasterCard/VISA shown below.

NAME ON CARD:_____ EXP.:_____

❑ MASTERCARD ❑ VISA #:_____

SIGNATURE FOR CHARGE AUTHORITY:_____

Applications without payment will be returned. Applications from outside U.S., enclose additional $20 (U.S.) to cover mailing expenses.

SCTE® CABLE-TEC EXPO® REGISTRATION

Everyone must register. ID badges **must** be worn and visible at all times in workshops and on the EXPO floor. To avoid delay, fill in all information requested. Full and complete payment must be sent with this registration form. Hotel reservations must be made using the Attendee Housing Form on the reverse side.

Registration Fee includes technical workshops, exhibit hall and hospitality/entertainment events. SCTE Active, Senior and Charter Members must provide Member ID Number. New Members applying at this time must include SCTE Member Application and dues payment.

If you wish to register more than one person, please make copies of this form.

✻ **PLEASE PRINT OR TYPE** ❑ Mr. ❑ Mrs. ❑ Ms.

YOUR NAME: _____ (First) _____ (M.I.) _____ (Last)

NICKNAME: _____

TITLE: _____ COMPANY: _____

ADDRESS: _____ (Street/P.O. Box)

_____ (City) _____ (State) _____ (Zip)

TELEPHONE: (_____) _____ SCTE MEMBER #: _____

FAX #: (_____) _____ AMATEUR RADIO CALL SIGN: _____

✻ **REGISTRATION FEES** (Please check the appropriate box)

Registration forms accompanied by a paid membership application may pay member rate.

	Pre-Registration Until May 13, 1994		**On-Site** After May 13, 1994	
	Member	Non-Member	Member	Non-Member
Engineering Conference and Expo	$240	$340	$280	$380
EXPO only	$190	$290	$230	$330
Engineering Conference only	$145	$225	$185	$265
Spouse Registration	$95	$95	$95	$95

(Spouse registration includes: All Sessions, Exhibit Floor and Awards Luncheon) $ _____

#_____ Additional Awards Luncheon tickets @ $20.00 $ _____

TOTAL AMOUNT ENCLOSED: $ _____

✻ **PRE-REGISTRATION FORM** - must be received **BY MAY 13, 1994. After that date, all registrations must be handled on site.**

✻ **Cancellation Policy** - A $50 cancellation charge is applicable to all registrations cancelled after **May 13, 1994. NO refunds given after MAY 27, 1994.**

✻ **METHOD OF PAYMENT**

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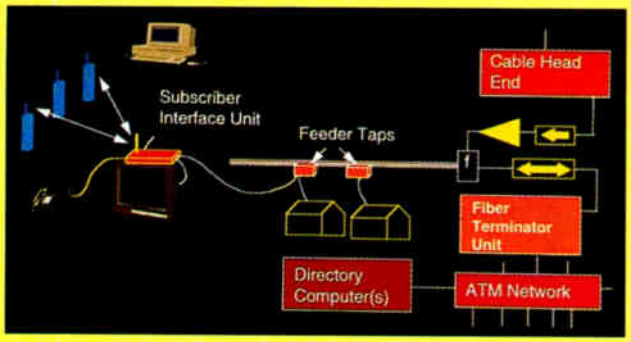
Figure 3: Simplified view of the COM21 system



your rental income. After you accumulated even more money, you build big red hotels. And, when any of your rival players landed on them, you really cleaned up.

Since 92% of the TV homes in the United States are now passed by cable, the properties in the real game have already been divided up among the players. We are beyond that stage. Investment in new technology to increase revenue is needed — more channels, pay-per-view and movies-on-demand. These investments are the little green houses. So far, so good.

Now, with the new digital technology available, the cable TV industry is in position to build the big red hotels — with new revenue opportunities. The two largest potential markets that can be addressed with the evolving future fiber-rich digital TV plant are telephone and multimedia.

How large? The telephone industry is about $150 billion/year and multimedia, while hard to define, is said to be on the order of $120 billion/year. (See Figure 2 on page 44.)

Of course only a portion of these revenues are relevant but the overall numbers are big. Take catalog shopping, for example, at $52 billion/year. Then there's home video games with $5 billion/year, which is equal to the total U.S. domestic movie market revenues.

Some factors underlying opportunity

At this point, the following need to be considered:

- Growing requirement for two-way digital data to the home.
- Incremental deregulation of the telephone industry.
- Availability of a cable TV network with up to 1 GHz transmission paths to homes.
- Availability of new technologies such as asynchronous transfer mode (ATM).
- Cable TV movement to digital.

To address these new opportunities we created a new company (COM21) to design the missing pieces of technology to create a new telecommunications system specifically addressed to most economically meeting today's and tomorrow's home and business two-way telecommunications needs. (See Figure 3.)

Our starting point premise is that if one were to design a new telephone system to meet today's and tomorrow's requirements, it would not be built the same way as our existing telephone system. It would be built using new technologies. Of course, the new system would have to seamlessly integrate with the existing and evolving telco system. But, functions that once required a large and complex installation like the telephone central office, are today relatively simple to implement in newer technology. New fiber-optic, digital and radio technologies open new options to the designer.

The COM21 system

The following are some features of the system:

- An overlay on the fiber-intensive cable TV systems evolving.
- Low incremental cost.
- Clean interface to evolving telephone system.
- The ATM cell.
- Virtual circuits.
- Efficient use of the upstream channel.
- Directory translation functionality.

In specific, the COM21 system is designed as an overlay to integrate with the fiber-intensive architecture of the newer cable systems, especially those following the path representative of the evolving Cable Television Laboratories architecture.

The COM21 system seeks to offer a significantly less expensive platform for telephony than the existing telephone system by use of the latest digital ATM fast packet switching technology throughout while using the cable TV facilities to serve as a shared transmission path. To minimize those system costs involved in the interconnection between subsystems, the digital data is converted to ATM cells as close to the input/output terminal devices as possible.

The ATM cell properly used is the key to the delivery of information from any point to any other via virtual circuits. In an extension of the present ATM approach, the virtual circuits are carried down to the end transmission tails. This also allows very efficient use of the limited 5-30 MHz upstream path of the early generation cable systems. This is important because this limited capacity transmission must be used efficiently to carry the heavy telephone or cable traffic anticipated.

At the upper end of the networks, voice telephone calls and computer-to-computer data calls interconnect with the local telephone system and interexchange carrier long distance facilities. While offering more features and benefits to the subscriber, the new system can utilize the subscriber's existing telephone devices and in-building wiring investment.

Based upon initial cost estimates, the capital required to install a COM21 system is estimated to be about one-third the cost for an equivalent local telephone system (with most of the cost occurring when each subscriber is connected). Reduction in cost is achieved through the efficiency of the shared use of existing facilities both within the local cable TV system as well as within the subscriber's home or business.

The COM21 system can use small, personal cordless telephones sharing a 2 Mb/s channel in a no-license-required radio band. Up to eight or 10 different voice conversations can be simultaneously supported per house together with high-speed data terminals and multimedia-based computers. An optional modular jack allows connection to the existing telephone system in the house for origination or reception of calls from either the present local telephone carrier or via the COM21 system. The modular jack arrangement allows full compatibility with existing consumer telephone equipment, fax machines, modems and existing in-building telephone system wiring. Flexibility to dynamically add devices to the network without installation delays is designed into the system, as each handset or data terminal interface has its own unique number. The entire system utilizes ATM cells for maximum efficiency and simplicity of system in-

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terconnection. Very high data rates of up to 155 Mb/s can be provided to meet the high bandwidth requirements of some business customers. Interconnection via fiber loops to the long distance telephone system is facilitated by use of the all-ATM cell architecture.

(A technical description of the COM21 system can be found in "The Role for Cable and PCN," *Proceedings of the Society of Cable Television Engineers Annual Conference on Emerging Technologies*, New Orleans, LA, Jan. 7, 1993. And, there is a second article describing the system, "Radical Telephone Grabs Huge Bandwidth Promise," in the May 1993 issue of *Signal* magazine.)

ATM is something we are going to hear increasingly more about in the future. (See Figure 4.) ATM is built around a 53 byte cell packet. Of that, 48 bytes contain the payload and 5 bytes contain housekeeping information including routing information.

The packet cell has magical property. (See Figure 5.) It carries the information to allow routing itself through a network and do so at whatever speed the individual links of the network can support. This means that each link of the network carries traffic from diverse users in intermixed fashion. Everything gets delivered to its final destination automatically and very quickly. With the movement to ATM, our historic circuit switching becomes replaced by a new approach of virtual circuits from any point to any other with the switching intelligence being contained in the packet cell, rather than stored within the physical switch as in the case of circuit switching.

In converging higher level networks the differences are in terminations. That is:

- The telcos and the cable TV companies both will be using somewhat similar technology at the tops of the network.
- The major opportunity for differentiation is the tails of the network.

Cell switching allows you to combine signals from many different intermittent sources, each operating at a different input rate. Each physical link conveys the packets from all. These are sorted out to each separate desired destination.

What was once a large complex switch can now become smaller and smaller as the switching intelligence is increasingly contained within the cell itself and the switch functionality readily fits onto fewer and fewer silicon chips. This in turn leads to a system with simple plug-and-play properties.

Of course, the telcos are fully aware of ATM and its implications. That's where ATM came from a few years ago. But it was really the computer networking folks, not the telephone industry, who were responsible for ATM's rapid conversion into a viable general purpose technology.

A competitive factor is the telephone industry's ISDN (integrated switched digital network). ISDN was to be the universal standard for providing digital services to businesses and to the home. Unfortunately ISDN was conceived in the circuit switched era and didn't fully anticipate the direction of technological development. ISDN tends to be constraining to the user, expensive to implement and its complex standards open to misinterpretation. A classic example is that using the same international standard AT&T and Bell Northern have chosen two different implementations so that ISDN terminal devices from one don't work with the other's switches. (See Figure 6.)

Most recently, a subset of the standard called N-ISDN for (national ISDN) was announced by several of the regional Bell operating companies (RBOCs), only to be followed by US West and Southwestern Bell declining to go along. The telecommunications industry has far less confidence in ISDN, particularly with the potential ATM alternative option.

Figure 7 on page 50 shows a *Business Communications* magazine readership survey where ISDN is viewed very negatively relative to ATM in terms of likelihood to produce real benefits and in meeting expectations. Nevertheless, the likelihood of ISDN being implemented is increased by actions of an unlikely source. The Electronics Frontier Foundation with strong lobbying strength has been pressing Congress and the regulatory agencies for the need to provide low-cost, higher data rate services to homes, schools and libraries.

Its proposed solution is to encourage the telcos to provide low-cost ISDN, in exchange for regulatory relief elsewhere. Here the champions for an unsatisfied user requirement are pressing for a technological direction given the immediate viable lack of alternative. →

Figure 4: The standard ATM cell

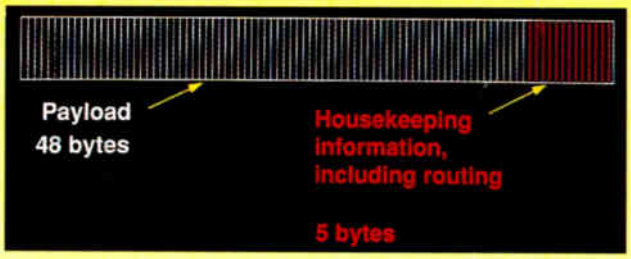


Figure 5: Fast packet or cell switching

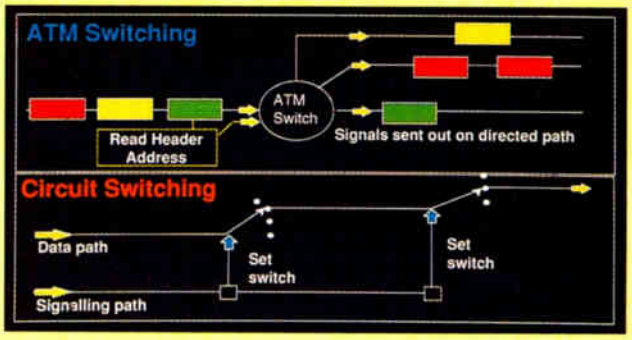
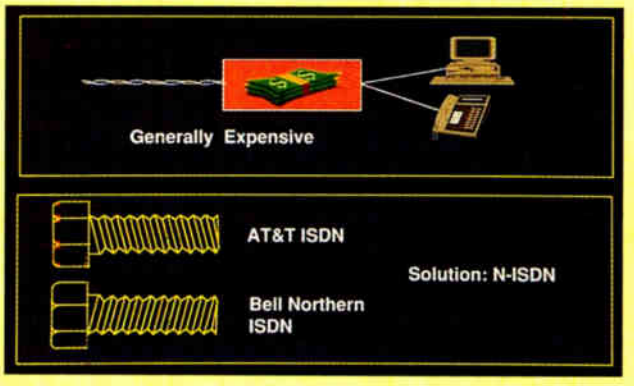


Figure 6: ISDN termination



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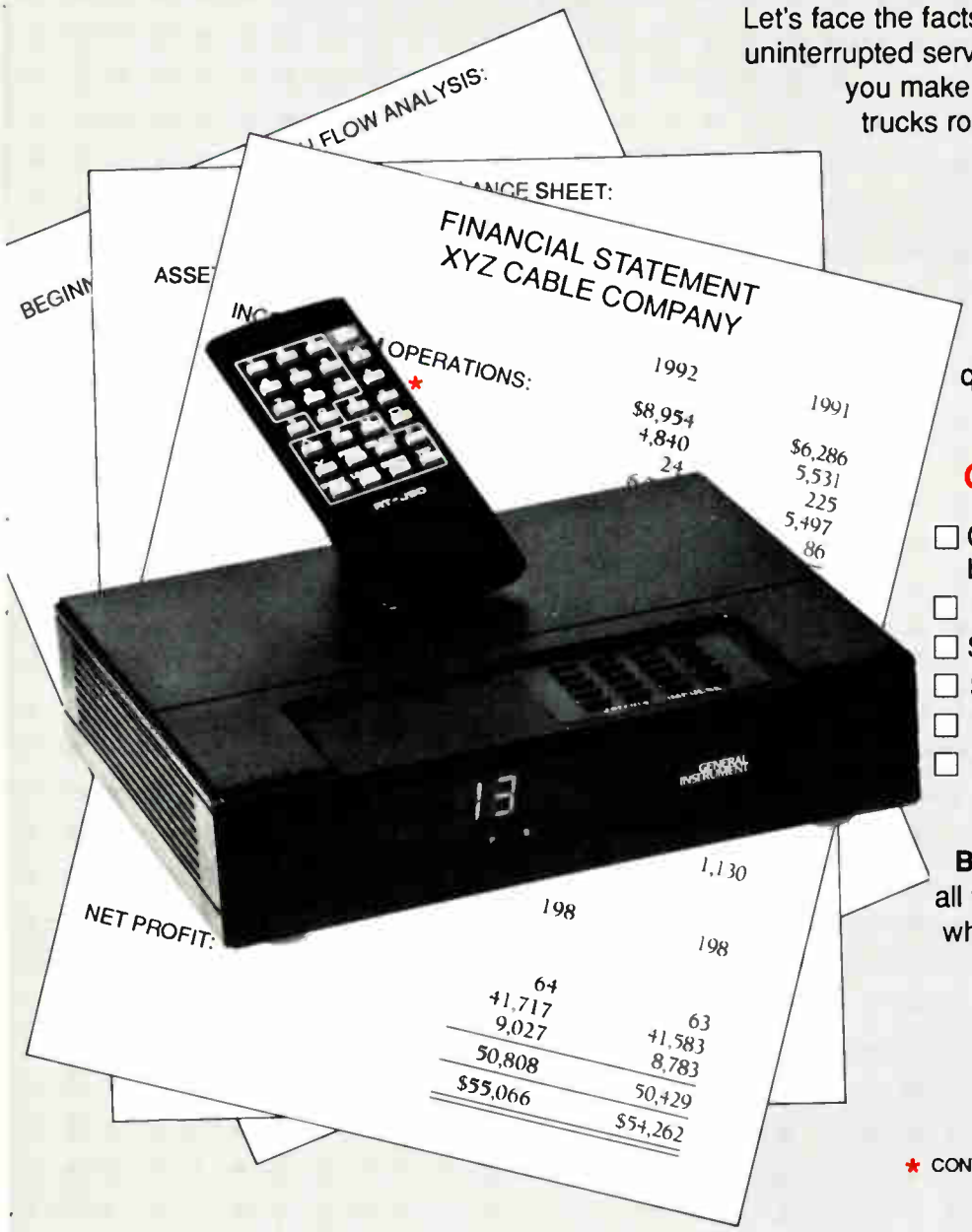

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How this demand vacuum is filled will to a major measure be determined by whether the telcos or the cable TV industry is able to offer the more cost-effective technology.

Both the telco and the cable TV industries are moving toward a universal communications system carrying voice, data and television over fiber-optic links with voice and data in the form of ATM cells. At the top of the networks, both the telco and the cable industries' approaches appear to be converging. Each system in the future will resemble the other. The major critical difference is the last few miles — the local loop as the telephone companies call it. To overcome the data rate choke point of the twisted-pair local loop, the telephone industry has been pushing the development of improved digital twisted-pair transmission technologies. These include asymmetrical digital subscriber line (ADSL), HDSL and N-ISDN.

ADSL provides a 1.5 Mb/s data path in one direction and a lower data rate in the other direction for the delivery of data. HDSL, high-speed digital subscriber line, uses two twisted-pairs, one in each direction. For local loops in relatively close proximity to the central office with short transmission distances, the data rates can be increased using these technologies into the 4 megabit per second or higher range.

Here, the advantage of cable TV's availability of a 1 GHz capable coaxial cable to the home has a major cost performance advantage over the telephone company's twisted-pair.

Some options facing the telcos are:

- Overbuilding.
- Joint venture arrangements.
- Regulatory wars.
- Purchasing cable systems (50 million subscribers at $3,000 = $150 billion).
- Do nothing. (Cable may increasingly become the provider of new digital service.)

Of course, the local telephone carriers could change their tail circuits and overbuild with coax. They could acquire cable TV systems (something that is presently prohibited within their own telephone service areas) or work together with cable TV companies. The technical options are open.

It is interesting to watch the convergence of interest of these two industries with a common potential customer base.

Figure 7: ATM vs. ISDN

Emerging Technology Considered	*ATM SONET*	*ISDN*
Most likely to produce real benefits	34%	9%
Least likely to meet expectations	13%	44%

Source: ***Business Communications Review 1993 Readership Survey,*** May 93, p. 31

Michael Bowles of Hughes Aircraft Co. asks the amusing question, "What would the costs and revenues likely be if, a) The cable TV companies entered the telephone business, and b) The telephone industry entered the entertainment TV business?"

This is a "no-brainer." The cost of cable entering into the telephone business is moderate, while the economic upside payoff can be very large. And, the opposite appears to be true for the telco industry's entry into cable TV. Thus, the cable TV industry appears to have more to gain from this coming competition, while the telephone industry, as we know it today, has more to lose.

In summary, the cable industry has the far better transmission path to the home — the coax drop cable. The very limited end tail capability of the telco's twisted-pair is likely to be so constraining that the telcos will be pressed to obtain an equivalent capability — whether it be by overbuilding, partnering arrangements or even investment into cable companies to obtain the access tails.

It will be fun to see how the game is played out. **CT**

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The right path to cable TV/telco convergence

By Laurence Bloom
Vice President, Cable Resources Inc.

The merging of the telephone and cable TV technologies is a milestone along the path of the 150-year development of wired communications systems. At such junctures it is always worthwhile to look back and review the trail that led us here.

A national communications system became a reality in the middle of the last century with the construction of a telegraph wire that connected the East to the West and the North to the South. The construction of this (the first wired communications highway) was possible because of the assistance of the federal government that granted the developers of the system the power of "eminent domain." This allowed them the ability to acquire the strips of land needed to erect the telegraph poles along a straight line without having to negotiate with every land owner along the way. As a result, the wire could travel from city to city and state to state in an efficient manner. This initial interstate wire communications system had the capacity to send messages one way, one message at a time.

The result gave any company (for the first time) the ability to do business with potential clients at distant locations in minutes as opposed to weeks. The ease of rapid communications opened vast unmarketed territories for companies to sell to that until then were unreachable.

The telephone system was the second generation of wired communications systems. Developed and constructed in the first third of this century, it provided a major leap in capabilities over the telegraph system. The telephone system is two-way whereby users could have interactive conversations. The capacity of the system was greatly increased and allowed voice communications.

The federal government supported the development of the telephone industry by creating an atmosphere that allowed services to be provided to the public free of interference by local and state government. The federal government also developed a common carrier policy that recognized that telephone services could be provided by a monopoly service provider without competition.

"Why would a cable TV/telco company get rid of a cable system that has 30 times more capacity than the telephone system retained?"

Cable TV systems, which originally were no more than extensions of telephone systems, began to appear in the middle of this century. They were created to support the transmission of television stations. Since then they have grown in design to enable them to provide a wide variety of services ranging from high-speed data transmission to interactive video programming.

The third national wire communications system is presently under consideration in the guise of a communications superhighway. The federal government over the last couple of years has clearly expressed its interest in the development of a nationwide advanced communications network. President Clinton and Vice President Gore have made public pronouncements advocating the need for a new advanced communications infrastructure. Congress, through several oversight committees, also has supported the concept of a communications superhighway.

The need for a more sophisticated communications network is being created by advances in computer technology, increased usage of telephone services and the expansion of video and interactive entertainment sources. The Federal Communications Commission and the Commerce Department have as their mandate the development of reliable state-of-the-art communications systems and the making of them available to the public.

The Duopoly Rule

The government has a duty to review the merger plans between a cable company and a telephone company to ensure the maximum amount of telecommunications services will be available to the public at reasonable prices.

The first policy to review is the FCC's "Duopoly Rule." This rule simply states that a cable company or a telephone company cannot "own," "operate" or "control" both a cable TV system and a telephone system in the same service area. In many telephone service areas cable TV companies own, operate or control cable TV systems. Before the failure of the merger, TCI/Bell Atlantic were reported to be ready to sell or trade off the cable system and keep the telephone system in all of the areas where there was a conflict because of the Duopoly Rule. These overlapping service areas included some extremely high volume territory. Will this also be the decision made when a cable TV/telco convergence does inevitably happen?

Why?

Why would a cable TV/telco company get rid of a cable system that has 30 times more capacity than the telephone system retained? A state-of-the-art cable system today carries 50 or more video signals. It can carry hundreds of audio signals and many thousands of data streams simultaneously at high speeds.

The telephone system doesn't have the transmission capacity to carry more than two video channels into the home. Nor does it have the capacity to carry data at high speeds. Why wouldn't a cable TV/telco company want to sell the telephone system and upgrade the cable system so it can provide all the services presently available on both systems?

The challenge should be to retool the already operating cable system. To really make the superhighway work there

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is a third partner that is needed. That is a computer company that has the capability to create computers powerful enough to drive a communications system conducting at least 2 billion transactions per day. A computer is needed that will be able to provide switching capacity for this enormous flow of information whether the source of the transmission is data, video or audio. A computer company that can provide record keeping and billing functions for 50 million accounts or more is necessary.

The engineering mission would be to develop the coaxial cable to a level where all of the present and future telephone and cable TV services and customers can be accommodated on the same system. A parallel goal would be to increase the cable system's efficiency by making it more reliable.

The idea of expanding the uses and efficiency of a wire-based communications system is not new to a telephone company. The telephone system (when it was created over 70 years ago) was designed to be a six-party system. That means there would be one telephone line for every six homes.

Over the years the demand for telephone services has increased beyond the originators' wildest dreams. To keep up with the rapidly expanding demand for more telephone service and to accommodate new service offerings, the design and engineering people at the telephone companies have done an outstanding job. They have stretched, magnified and honed the twisted-pair wire system to the point we are at today. The telephone system provides not only voice service but also offers some data transmission and facsimile services.

In the end, the barrier that will prevent this system from meeting the demand for high-speed data transmission and video services is the limitation of the twisted-pair wire, which is the backbone of the telephone system. The copper wire in the telephone system is thinner than coaxial cable and has a lot of impurities. On the other hand, the copper center core of the cable system has much greater capacity. This difference in the technologies should support the concept that the cable system is better designed than the telephone system to be the backbone of any futuristic wired communications superhighway. It also is worthwhile noting that modern cable systems are still in their infancy stage. With proper engineering and innovative designing the uses and reliability can be matured into a wire system that will provide sufficient capacity well into the 21st century.

A strange outcome of divesting the cable system as opposed to the telephone system is the edge that it will give to the company that purchases the cable system. When the purchaser upgrades the cable system it will be able to provide a full range of existing and new services several years ahead of the company that kept the telephone system. An existing cable system can be retrofitted to be the wire superhighway of the future in five years or less. On the other hand, it will take closer to 10 years to develop and construct a totally new communications highway. Selling off the cable system will provide a giant head start for the buyer. Once the cable system is divested, the cable TV/telco company would then have to begin from scratch to construct a new wire system.

Again the question is why? Why give up an existing 50 video lane high-speed highway with 30 times the transmission capacity and keep a two-lane road that has to be replaced very soon because it can't be fixed or expanded any further? →

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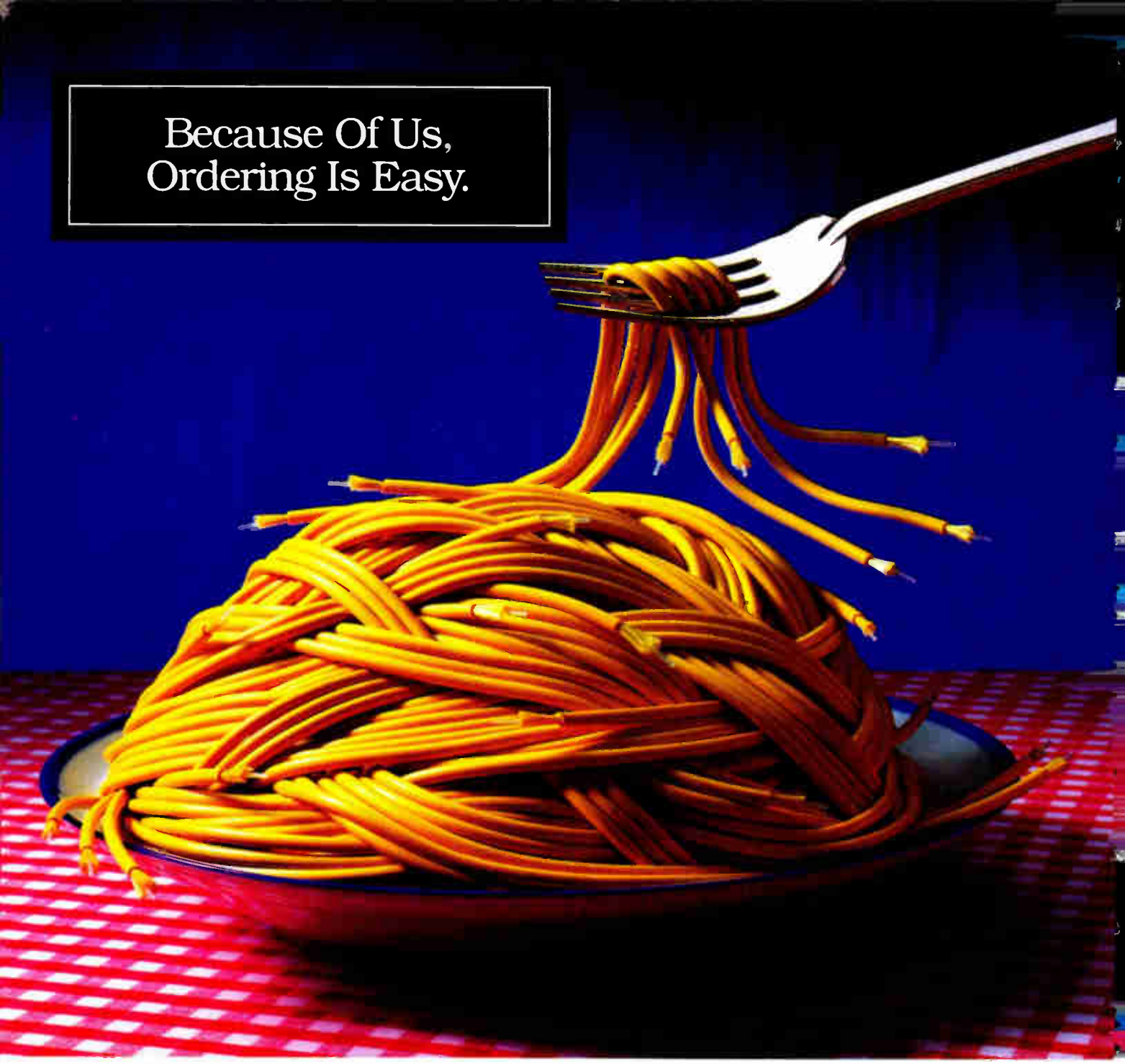

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A second approach to dealing with the Duopoly Rule analysis is not to sell either system but to merge both customer bases onto one system. That is to merge the telephone and cable systems into one single telecommunications wire system thereby eliminating the need for the application of the rule. The Duopoly Rule outlaws ownership of a cable TV system and a telephone system in the same service area.

Under a merged system approach, a cable TV/telco company would own, operate and control only one wire system that provides all services to the combined customer base. This merged system would provide the full range of data, voice and video services.

What a cable TV/telco company would need from the government is time to merge the systems. The company would seek approval for the system merger from the FCC and other governmental authorities charged with the oversight of communications policy. Then the company would request a transitional time period to design and implement a plan to merge all of the services provided by both systems into a one-wire communications superhighway.

"The cable system is better designed than the telephone system to be the backbone of any futuristic wired communications superhighway."

The plan could have time lines built in to ensure that the process is done as quickly as practical. Once all of customers for data, voice and video services are serviced off a single system, then the cable TV/telco company could use the abandoned telephone system for other purposes. One suggestion could be to use it as a backbone for an intergovernmental communications network. Governmental bodies can create a separate government communications system that will connect local, state and the federal government.

Cross-ownership

Another puzzling stance taken by TCI and Bell Atlantic before the failure of the merger was the belief that they would remain in the programming business. On the surface it seems that such a position would be the quickest way to draw the government's attention to a potential antitrust violation. Owning and operating a communications superhighway and providing programming for it could be likened to waiving a red flag in front of a bull.

Since the founding of antitrust legislation almost 100 years ago, a cardinal "no-no" has been to violate the rules concerning vertical integration. Vertical integration is when one company controls several key elements in a distribution chain. As an example of this principal, a quick study of the oil industry points out the problem. In the past, the oil companies grew and expanded their influence by owning, operating or controlling a combination of companies that controlled the flow of oil from the time it was pumped out of the ground all the way to the pump at the gas station. They owned oil rigs that drew the oil out of the ground. They owned the chemical plants where the oil was processed and

refined. They owned the trucks and the pipelines that transported the oil. And finally, they owned the gas stations.

This combined ownership formed a chain that acted as a barrier to prevent any new company from entering the oil and gas industry. The government feared that for one company to have that much influence lessened the ability to have new competition within the industry. The government frowns on vertical integration because it is anti-competitive. It creates high barriers for new companies to enter the industry. The environment created by the oil cartels was such that an independent company not involved in the entire distribution chain was unable to stay in business. As a result the great oil cartels were disassembled.

The idea that a cable TV/telco company would get involved in owning, operating or controlling programming companies makes very little sense. It would already be under severe governmental and public scrutiny because of the impact that such a joint venture will have on the communications industry. The idea could be viewed as crossing a very dangerous line that restricts competition and makes it very hard for new companies to enter the communications industry.

Five of the largest six cable companies all have significant ownership in pay cable channels, production studios and syndication program rights. If in order to continue to compete or be a new player in the wired communications industry a company has to have both a delivery system and a programming capacity, the number of potential competitors will be greatly reduced.

At the present time, the FCC has no restrictions on cross-ownership between cable TV companies and programming companies. However, every few years it has been reviewing the question. The FCC has been hinting at adopting cross-ownership rules aimed at preventing these artificial barriers.

Conclusions

As early as the late 1960s there has been much discussion pertaining to the future of wired communications. Utility companies have looked to the wired home as a way to conserve energy and have the meters read from a distant location. Retail sales and marketing strategists have experimented with ways to get a purchaser to order products in the ease and comfort of the living room. Government, schools and industry have been studying and theorizing on a multitude of ways to use such a powerful network to get their message to the masses. In fact, so much has been said about the coming revolution that some of its future is already in the past.

The real competition between communications providers could be based on the differences between wired communications systems and advanced radio frequency communications systems. The rapidly developing applications for cellular telephone, microwave networks, two-way radio networks and beeper networks could result in both technologies competing to provide the same services to the same customers. An advantage that is gained by using the airways as a distribution system is that the user does not have to be attached to the system to be able gain access. Access to the wired highway requires an umbilical cord connection. Customers of radio frequency systems are more mobile because the transmitters and receives can be completely portable. **CT**

To contact the author at Cable Resources, phone (800) 537-9995.

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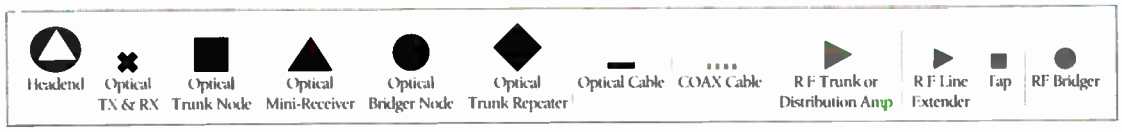

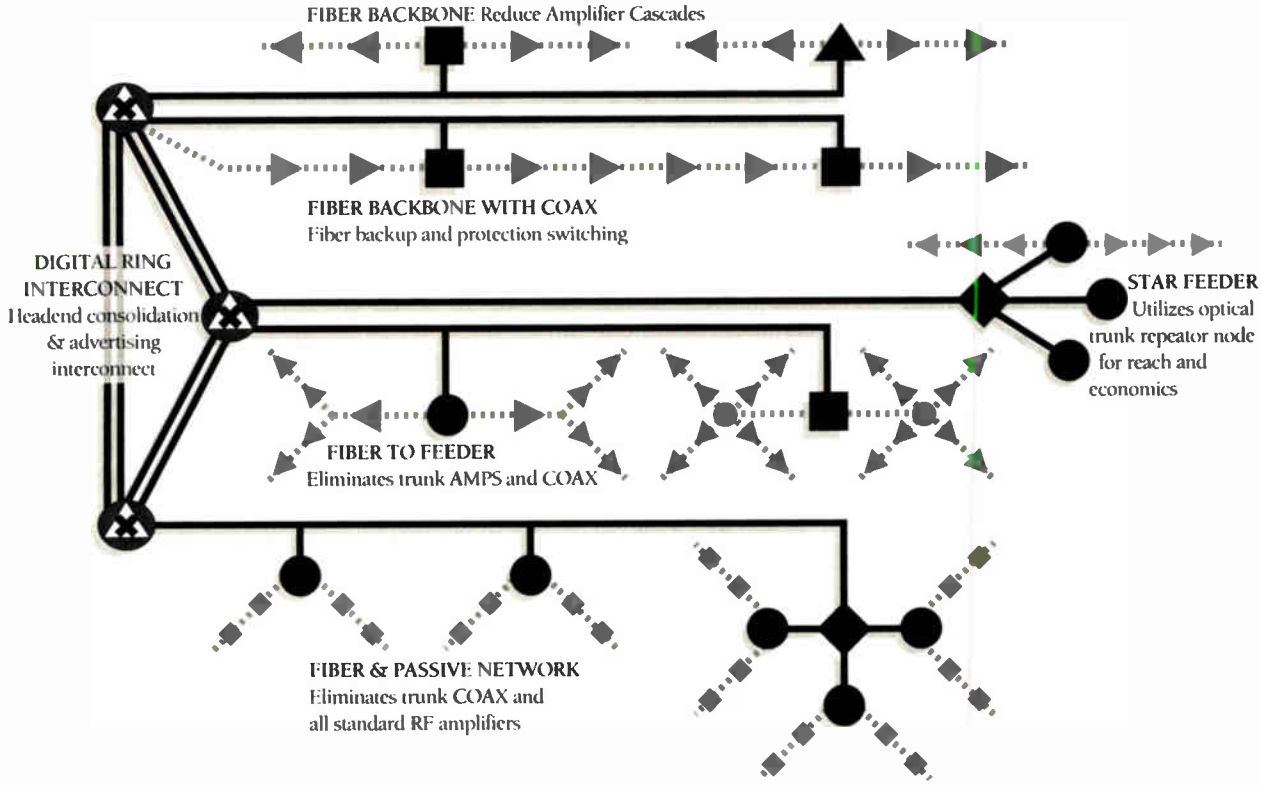

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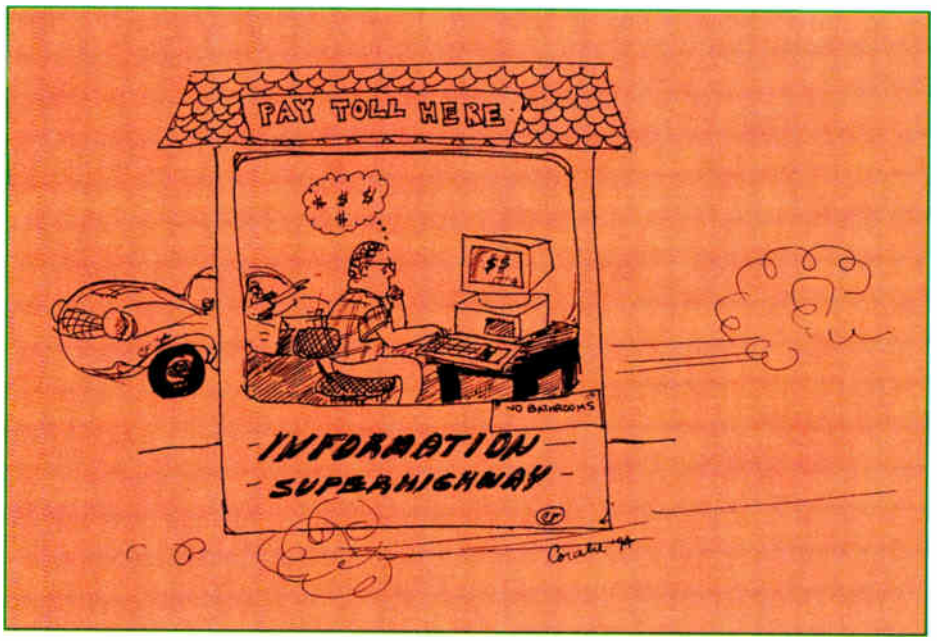
Reader Service Number 25.

Will the information superhighway be a toll road?

By Fred Rogers
President, Quality RF Services



The White House has launched a plan for a "National Information Infrastructure." The administration's plan includes easing of curbs barring local telephone companies from competing in long distance services. This initiative seeks to bring free advanced communications to schools, hospitals and clinics by the year 2000.

The administration plan calls for removing current cable/telco cross-ownership restrictions plus allowing telcos to provide video services in local exchange areas to promote investments and expand consumer choices. The question to be answered will be this: Can a true monopoly like the telephone company and a perceived monopoly like cable TV (70% of homes passed) compete for the same customer and charge less?

I guess when you own the printing press and spend five dollars for every four taken in, it makes sense to expect the following list of objectives.

1) Have several different suppliers build superhighways at a cost of up to $1,500 per passing for each supplier and expect the services to be free to the poor, sick or young and less expensive for everyone else while having multiple sources.

2) Force a competition where none existed before. Until now, the major reason competition has not existed between two cable companies has been one or both will not make a profit. Unlike government projects, private enterprise does not flourish without profits. Telephone companies have had a 100% coverage of their service area under heavy government regulation — but no competition.

3) Assume telephone companies that count house passings and customers as the same count to flourish when competition enters. (Cable TV has between 60% to 70% saturation of house passings on the national average.)

All my life I have been told the telephone service in the United States is the best in the world and I believe that fact. In business the rule of thumb has been "if it works, don't fix it." Most people are still wondering about the break up of "Ma Bell" when our government "fixed" the telephone monopoly last time. I have met very few people in my travels that claim they can add the charges on their present telephone bill to obtain the total bill or even understand what all the credits and charges represent. No one I know thinks the Bell break up saved the home consumer money. As a business person, the reduction of long distance charges was a blessing, but the cost had to be made up somewhere. And the cost was in the local exchanges, which had been subsidized by long distance revenues until the government broke up the Bells.

Cable TV in America must be leading the world. Why else would the used amplifiers removed from American rebuilds and upgrades be used in many other countries' "new" cable systems? In fact, there are few other industries where the United States so clearly leads the world in manufacturing and technology. United States firms lead the world in manufacturing cable TV amplifiers, hybrid ICs, coaxial cable, connectors, programming, and the list goes on and on.

I have never read a newspaper article or heard the government stating anything positive about the cable TV leadership role enjoyed by the United States. It seems when a legal business sector leads the world, everyone would be proud and our government would help not hinder a leading private enterprise.

Cable TV as an industry has received a bad reputation as being too expensive. To prove this our government asked the consumers if their cable bill was too high. I wonder what response the government would have received if the same question were asked about gasoline, electricity, rent, heating or taxes? I am sure most would answer: "Too high. Please lower these costs." The point is every consumer would like lower prices but the businesses supplying the service must make a profit.

The cable industry is being punished with rate freezes while competition has a free reign. If cable TV is charging too much, direct broadcast satellite (DBS) will be available to every house in 1994 and "wireless cable" (MMDS) also will flourish.

Telephone companies and cable TV companies will merge or be locked in a life or death struggle for each others' core business. The small operator may be squeezed out as the titans struggle for

(Continued on page 63)

April 1994

PM focus: Headends

BACK TO BASICS

The training and educational supplement to Communications Technology magazine.

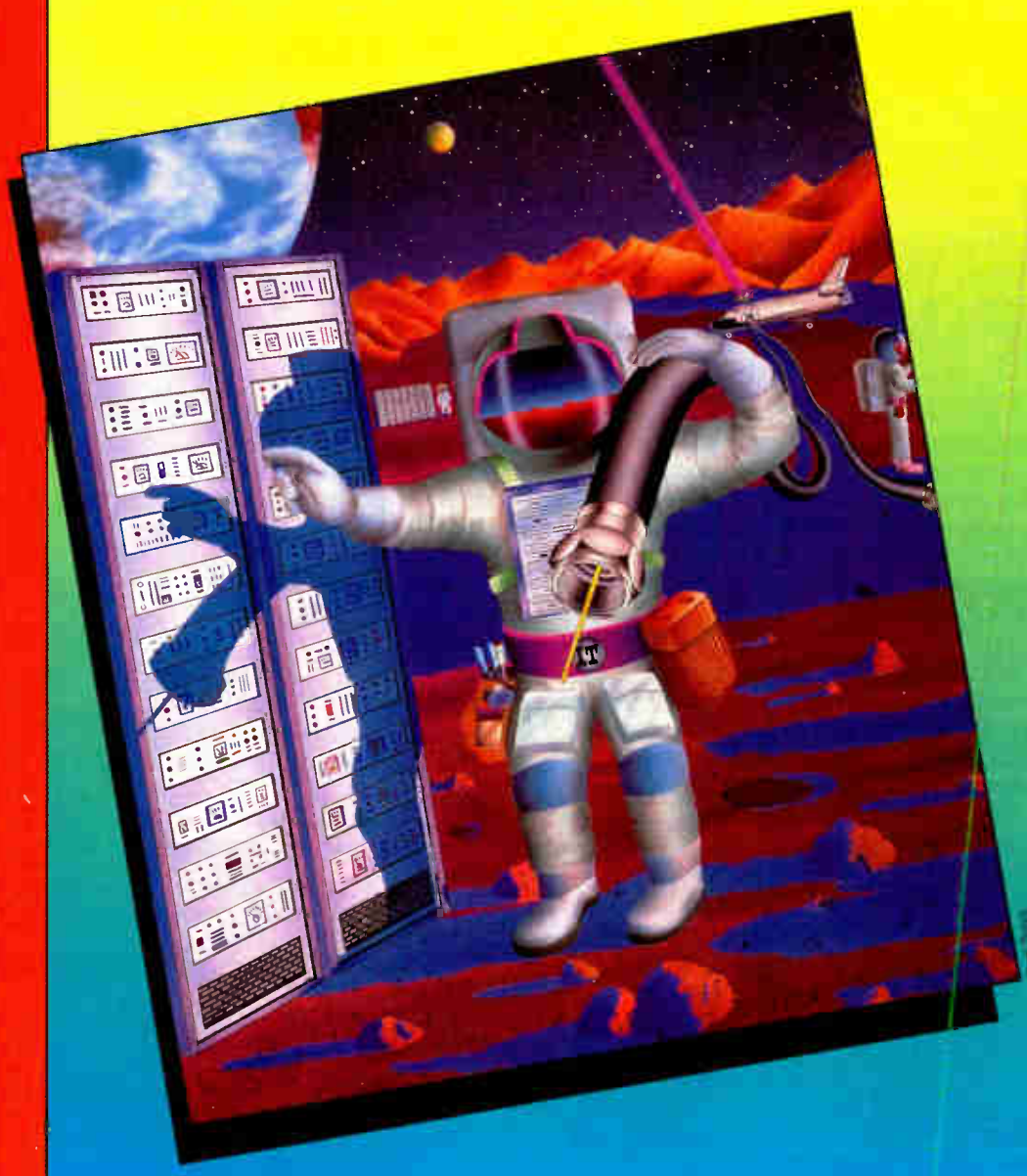


Table of Contents

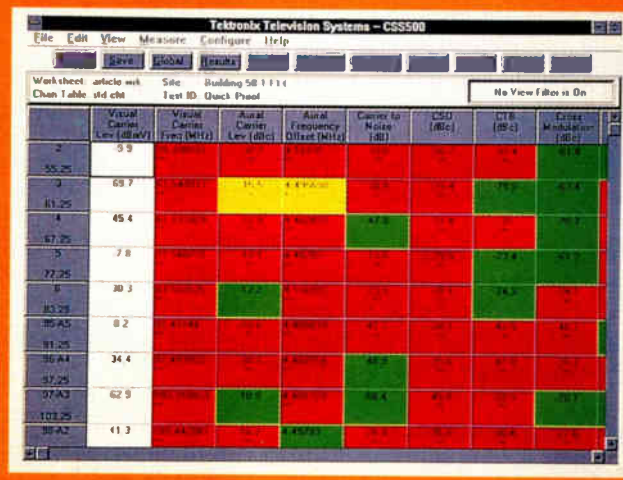
Programming for spectrum analyzers

By Jeff Noah
Technical Writer, Tektronix Television Division

The Federal Communications Commission proof-of-performance tests have convinced the industry of the need for automation. The combination of multiple measurement sites, several channels to measure and numerous measurements per channel adds up to a monumental measurement chore. Automation of measurement equipment programming, the measurement process and report generation reduces the job of FCC proofs to a manageable task.

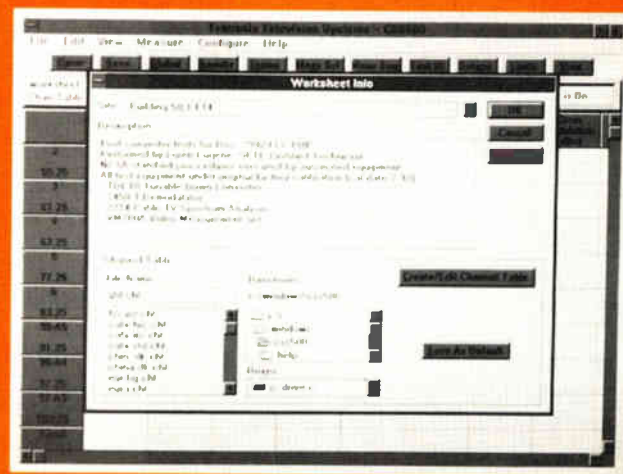
Since the majority of tests included in the FCC technical regulations require a spectrum analyzer, automating as many spectrum analyzer activities as possible pays the greatest dividends in streamlining the proof-of-performance process. Modern spectrum analyzers automate the actual measurement process, while software solutions speed programming the analyzer, cataloging measurement results and generating reports.

Figure 1: CSS 500's main screen



Note that all measurement results in this article's illustrations were created by a random number generator and are not representative of actual measurements.

Figure 2: Worksheet info screen



First ingredient

The process of automation begins with a microprocessor-controlled spectrum analyzer. Microprocessor control allows embedded measurement routines to direct the instrument through any number of predefined operations or measurements. It also provides the hook required for external control over the analyzer's operation.

Specialized cable TV spectrum analyzers, such as the Tektronix 2714, provide easy access to mandatory measurement routines. It takes only a few simple front-panel button pushes for users to execute measurements. When it makes sense, options for automatic, automatic with pause, or interactive (a microprocessor-assisted manual mode) measurements appear. For example, composite triple beat (CTB) can be set for fully automatic measurement, assuming the carrier of the channel to be measured is already removed. Alternately, automatic with pause mode stops the measurement process after measuring the visual carrier level, prompts the user to turn off the carrier and to press a front-panel button once that is done, and then completes the measurement. The interactive mode stops once the visual carrier measurement is complete and prompts the user to place a cursor at the first CTB measurement frequency.

Measurement routines

Another utility available on this and other cable-specific spectrum analyzers is the ability to store and execute measurement routines. Routines can include channel table assignments, definitions for CTB and composite second order (CSO) measurement locations, channels to measure, which measurements to make on those channels, what mode (automatic, interactive, etc.) to run the measurements in, and more. Entering this much information from a conventional instrument's keypad can be a time-consuming operation. And it usually requires considerable planning on paper just to map out all the necessary entries in the proper order.

Automating the automation

Building measurement routines on a PC and downloading them to the spectrum analyzer automates the development of routines as much as the spectrum analyzer automates execution.

Let's take a look at one PC-based solution available today. Tektronix' CSS 500 software provides a graphical interface for the point-and-click creation of documents called worksheets.

A worksheet can be thought of as a measurement spreadsheet. The main display shown in Figure 1 consists of a matrix labeled with measurement names across the top and channel numbers down the side, so each cell in the matrix can contain a measurement result for a specific measurement on a single channel. Built-in tools automate report generation and exporting worksheet data to a spreadsheet or data base for further statistical analysis.

The program is designed to control a list of measurement equipment (tunable downconverter and precision demodulator, baseband measurement set, and spectrum analyzer) for complete and comprehensive FCC proofs and quality control testing. For this article, though, we'll describe only its capability to program and control the spectrum analyzer. The analyzer connects with the PC through either an RS-232 or GPIB interface.

In order to automate a set of measurements, all the information entered into the spectrum analyzer also must be input to the worksheet, but it's considerably less work and less time-consuming entering the information into the worksheet. From the worksheet, a comprehensive user-defined program (UDP) can be downloaded to

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the analyzer with just a few mouse clicks. At that point the analyzer can be disconnected from the system and taken into the field. Once at the measurement site, two button pushes initiate the stored sequence of measurements.

Setting up a worksheet

When starting the program, an undefined (or default) worksheet appears. A worksheet must be configured before use. Configuring a worksheet accomplishes two things. It modifies the default worksheet settings to match the parameters of your system (channels/scrambling used, etc.) and lets you define measurement preferences (baseband or RF measurement of in-channel response, where to measure CSO, what measurement limits to use, etc.). Configured worksheets can be saved with unique names and used again in later sessions.

The "worksheet info" screen shown in Figure 2 (page 64) contains some very basic system information and a measurement site label. If you're preparing for measurements at the headend, "headend" or "TP1" might be logical entries for the site field. For convenience in creating future worksheets, all the site entries you create are stored in a pull-down list. This screen also holds the channel table for your system. If one of the many tables supplied with the software doesn't match your system exactly, customizing one is simple. A straight-forward channel table editor makes quick work of any necessary modifications (Figure 3).

The final field on the worksheet info screen accommodates the general information required by the FCC: operator qualifications, procedures used, and test equipment used and its last calibration date.

Figure 3: Channel edit screen

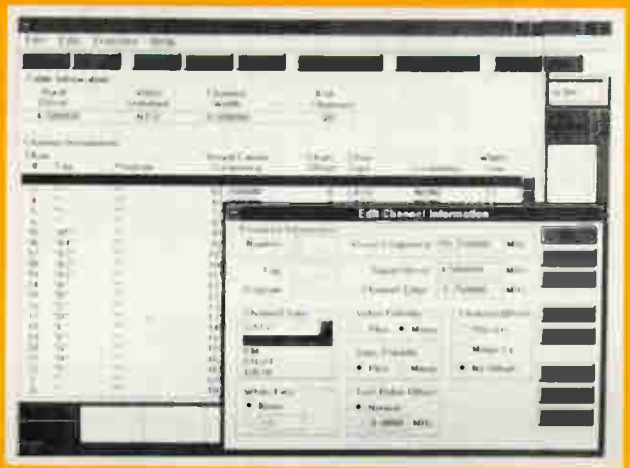


Figure 4: Test IDs

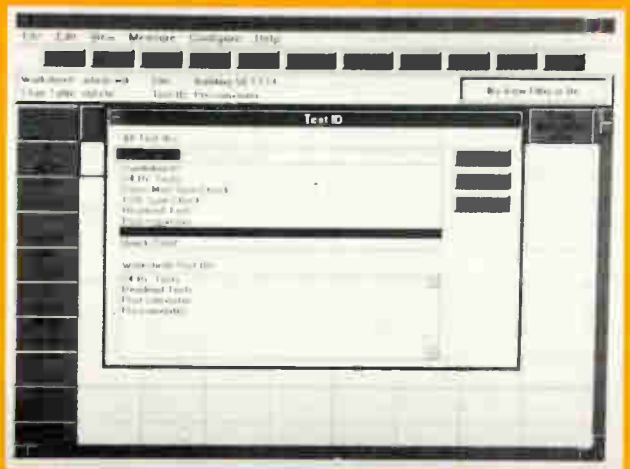


Figure 5: Preferences screen

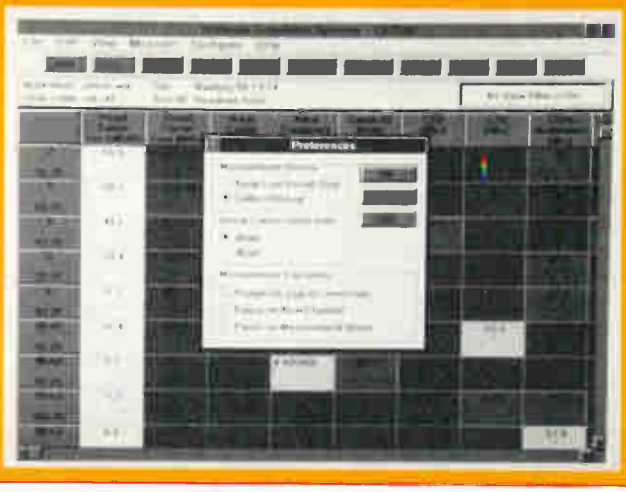


Figure 6: Measurement setups

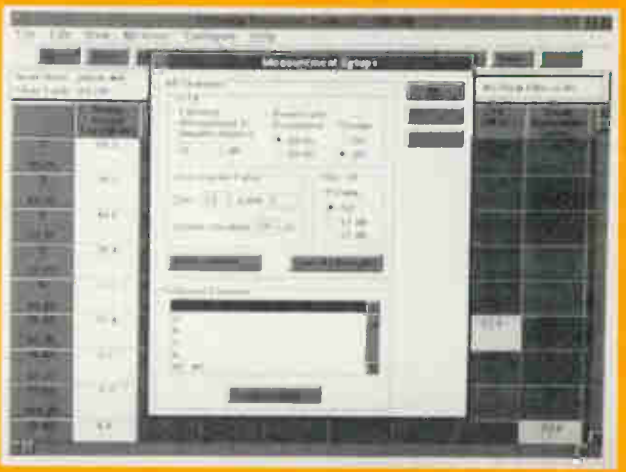


Figure 7: Edit setups

Since the FCC measurements fall into the clearly defined groups of 24-hour tests, pre- and post-converter tests, and headend tests, a method of keeping each set of measurements separate when downloaded to the spectrum analyzer is necessary. The "test ID" label serves this purpose. Whatever test ID is selected when a measurement is made becomes attached to that measurement result.

Figure 4 shows the test ID screen. The upper box contains all test IDs created after installing the software. The lower box shows all test IDs attached to measurements stored in the worksheet. Notice that not all the test IDs shown in Figure 4 have been used to label the measurements made with this worksheet. Test IDs also can be named to identify measurements made on the same worksheet by different operators.

The "preferences" screen contains still more setup options (Figure 5). The switch to enable history collection, visual carrier level units and some important measurement execution options are set here. Particularly relevant for spectrum analyzer measurements, the "pause on new channel" selection gives operators a chance to tune an external preselector to the next channel.

Selecting "collect history" from the preferences menu enables a worksheet to store multiple results of the same measurement on a channel adding a third dimension, depth, to the worksheet. From the main worksheet screen you'll only see one measurement result per cell, but results from previous measurements can be stored "behind" the displayed results. "Results detail" and "view violations," both discussed later in this article, provide access to the history.

The last pair of screens relating to system/measurement equipment configurations are the "measurement setups" and "edit setups" screens. Measurement setups (Figure 6) contains setup information about the analyzer, demodulator and downconverter used for measurements. Detailed data needed by the analyzer for the carrier-to-noise (C/N), CTB/CSO and in-channel response measurements is defined in the edit setups screen (Figure 7).

Measurement sequences

The final step before generating a user-defined program, or UDP, is creating the "measurement sequence," which defines the measurements the analyzer will perform. The measurement sequence screen (Figure 8) provides four preprogrammed sequence choices: "FCC pre-converter," "FCC post-converter," "FCC headend measurements" and "FCC 24-hour test." Each of the predefined options selects carrier levels and frequencies on all channels. In addition, selecting the FCC pre-converter sequence automatically selects the in-channel response measurement for the channels you indicate (Figure 9). While the measurement selection occurs automatically for each of the preprogrammed sequences, channel selection for the noncarrier measurements is done manually. The FCC post-converter sequence designates C/N, CSO, CTB, cross-modulation and

Figure 9: FCC pre-converter measurements

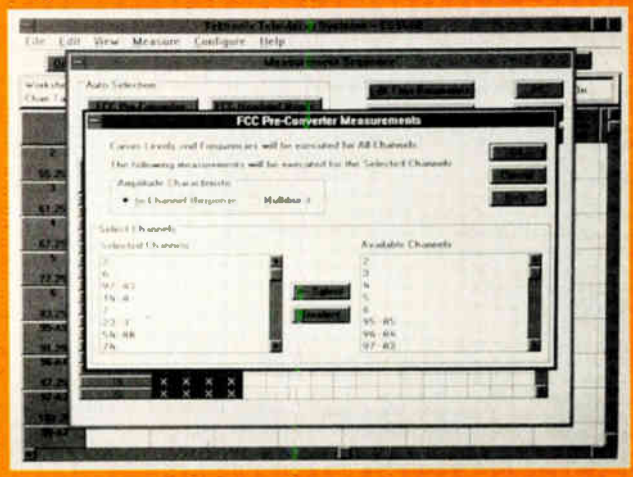


Figure 10: Double-clicking to select the entire

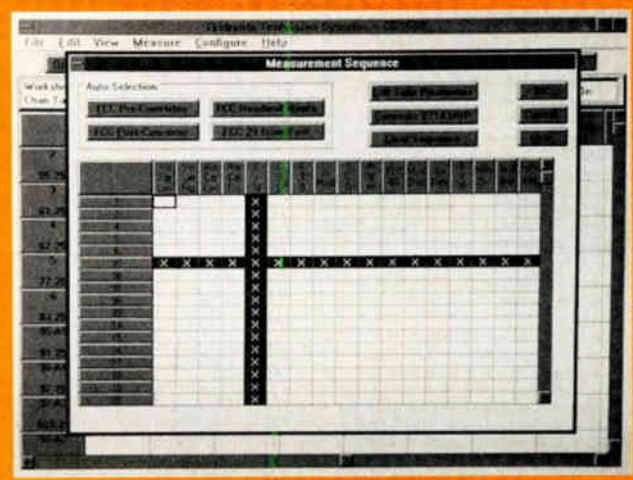


Figure 8: Measurement sequences

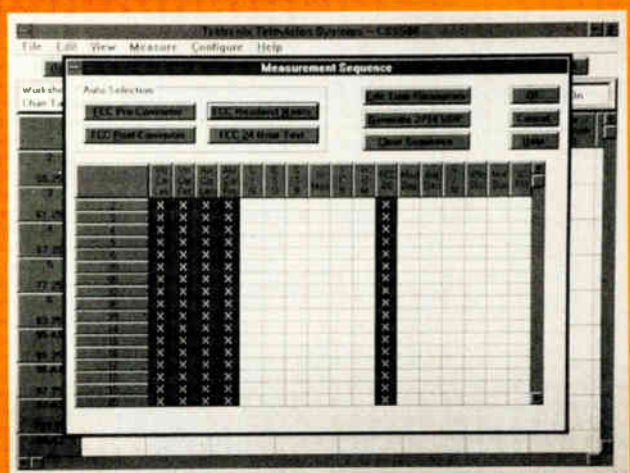
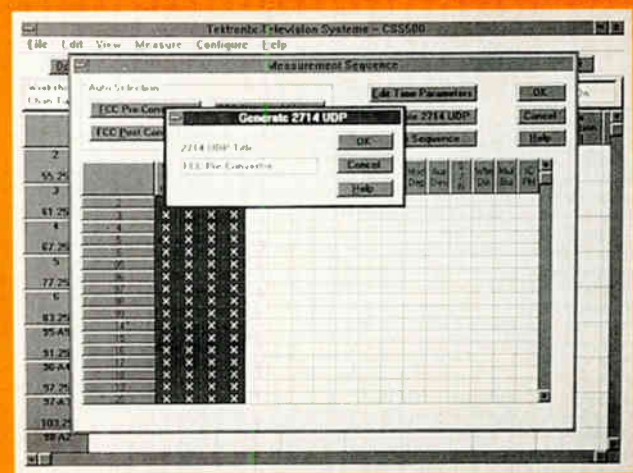


Figure 11: Naming the UDP



hum for the desired channels, and the FCC headend measurements sequence adds FCC baseband measurements to carrier measurements. The FCC 24-hour test selects only the carrier levels and frequencies measurements.

The software supplies commonly used sequences. To define your own, simply double-click on the desired channel/measurement

Figure 12: Uploading measurements from analyzer to PC

Figure 13: Status report

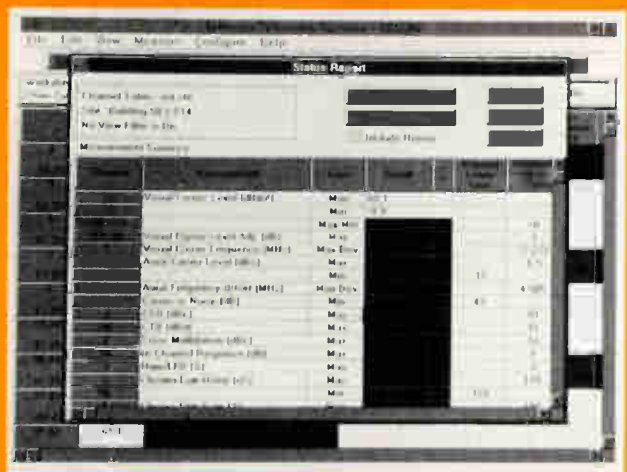


Figure 14: Results detail

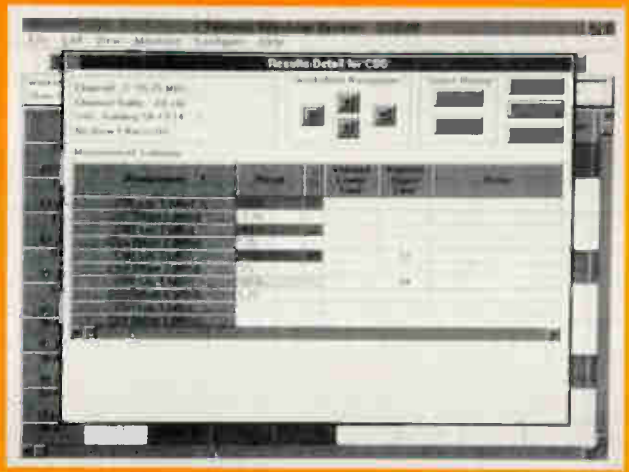


Figure 15: View violations

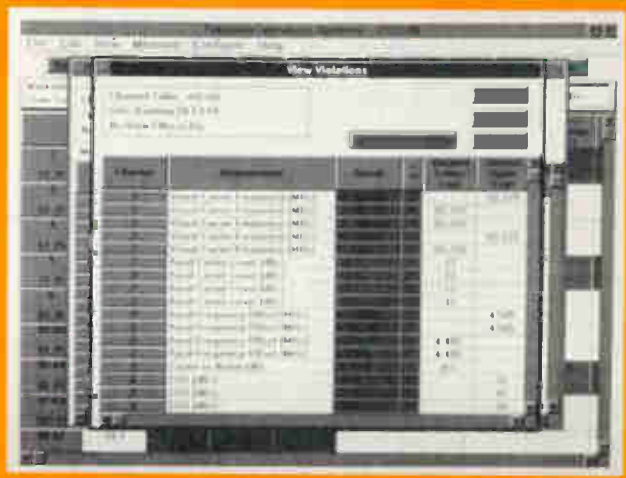


Figure 16: Copy option

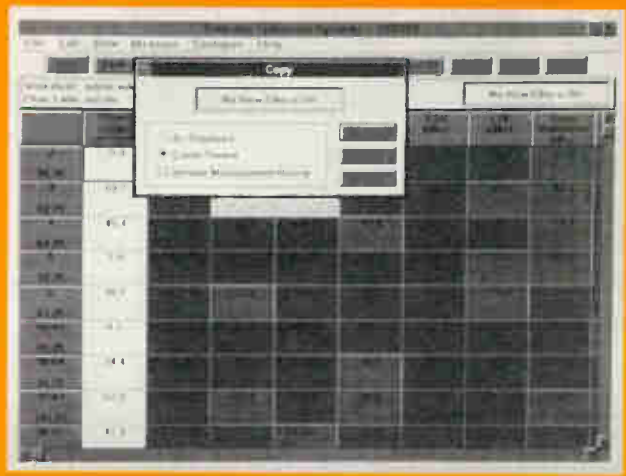


Figure 17: Measurement results exported to a spreadsheet

cell. Continue double-clicking until all the needed measurements are selected. By double-clicking on a channel number, all measurements for that channel can be selected at once. Double-clicking on a measurement name selects that measurement for all channels. Figure 10 on page 67 shows the results of double-clicking on Ch. 95 and on C/N.

The UDP

The measurement sequence screen contains the "generate 2714 UDP" button. After configuring the worksheet and defining the measurement sequence, clicking on this button pops up a window for naming the UDP (Figure 11 on page 67). Once you enter the name and click on OK, the program downloads all the information the analyzer needs for making the measurements identified in the sequence. (Remember that the current test ID is downloaded as well.)

The Tek 2714 spectrum analyzer stores up to nine UDPs. Creating separate UDPs for pre- and post-converter tests (with appropriate test IDs for each) makes it possible to label the test results obtained in the field. When the analyzer's test results are loaded back into the worksheet, the test ID label remains attached to the results making them easy to locate.

Running the UDP

Once you've downloaded the UDP to the analyzer, you can be disconnect the instrument from the computer and take it to the measurement site. Push a single front-panel menu button to reveal the list of UDPs resident in the analyzer. One more button push (corresponding to the name appearing on the analyzer's screen) and the user-defined program starts running.

The UDP controls the analyzer's built-in measurement routines, completing all the measurement tasks you specified in the UDP. The analyzer stores the results in nonvolatile memory for later downloading to the PC at the headend.

Automated reports

Report generation benefits from automation as well. Back at the headend, downloading measurement results is as simple as picking the "get stored results" from 2714 option via the "measure" menu. The 2714 downloads all stored results to the computer's memory and brings up a screen showing all the results files, by UDP name, that it downloaded (Figure 12).

At this point the results are not yet a part of the worksheet. To enter them, save the site name displayed as a results file with

(Continued on page 74)

quency range to 1,750 MHz, insertion loss of 0.5 dB typical, isolation 50 dB typical and return loss of 14 dB typical.
Reader service #201

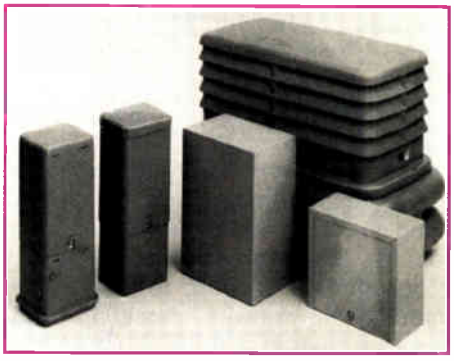
Hotel PPV

Cabil Corp.'s new No-Cost hotel pay-per-view (PPV) solution permits addressable systems to use their preferred make of standard addressable converters to offer residential PPV events, services and movies in non-regulated hotels, motels and resorts without any special equipment costs, fixed capital requirement or extraordinary startup costs. The service is compatible with Jerrold, Scientific-Atlanta, Pioneer, TOCOM, Zenith and other major manufacturer's addressable systems.

The solution features direct credit card billing for guest PPV purchases, which eliminates any hotel desk involvement or billing responsibilities, and makes it possible for an operator to serve virtually any mix of commercial properties and sizes, from a few rooms to hundreds of rooms per property.

The company installs its local computer-control unit at the system office or headend (at no cost to the operator), where it is directly ported to the system's existing addressable controller. The IVR/ARU thereafter receives all guest calls from served hotels and provides all support and delivery services automatically, including order taking, credit card processing, PPV delivery instructions to the system controller and confirmation of PPV order acceptance.

The entire order process typically takes 35 to 45 seconds, and PPV revenues are then directly deposited to the cable operator's bank account within a few days. For its ongoing, 24-hour-per-day turnkey services, and the use of its IVR/ARU computer system, the company receives a single transaction fee that also covers all credit card processing charges, fees, assessments and other bank and service charges.
Reader service #199



Enclosures

Reliance Comm/Tec Corp. now offers a series of enclosures equipped with an automatic, self-locking Slam Lock mechanism. Diversified Control's "star" design on the head of the Slam Lock offers greater security against unauthorized entry, according to the company, and can be used on a broad range of company enclosures.

When the door is closed or a cover is placed on an enclosure base, the mechanism automatically secures the dome/door onto the base and locks the enclosure. Multiple product sizes and applications offer a wide variety of single-source enclosure options.

Because the mechanism is offered on most company enclosures, it can

be used in multiple applications for tap, coupler, splitter, line extender, trunk amplifier and multidwelling installations.
Reader service #200

Cable

Trilogy Communications announced the AirCell product line. The premier product in the line is radiating cable, which is available in two impedances and is singularly constructed for communications in highly developed or underground locations (tunnels, subways, etc.). The new product line extends the company's coaxial cable diversity with the inclusion of an MC² 50 ohm transmission line. All cable products come with the option of zero halogen fire-retardant jackets.
Reader service #203

Mini OTDR

Anritsu Wiltron Sales introduced the MW9070A mini optical time domain reflectometer (OTDR). It is said to bring bench-top full-featured OTDR functionality into the field to make optical transmission line testing simple and efficient.

According to the company, this is the first mini OTDR with a modular design, allowing the user to add different wavelength optical modules or multimode modules in the field. This flexibility eliminates the need to purchase additional mini OTDRs or return the mini OTDR to the factory for upgrades.

The product automatically measures splice and fault location. The user simply presses a single button. Optimal distance and pulse width are selected automatically. The mini OTDR detects fiber faults, points of high reflection, far end points, measures splice and connector losses down to 0.1 dB and displays the waveform and event table simultaneously on a well-organized 7-inch LCD screen.

The high resolution screen is specially designed for use in the field. In addition to its large size, the variable contrast screen is easy to read, even in sunlight and low light conditions. The size allows individual fault points to be selected and observed in detail and lets the user auto zoom to specific points of interest. A real-time preview mode allows the user to verify that the proper fiber has been chosen and optimize connections, saving time and ensuring accuracy.

The unit has a dynamic range of 23.5 dB with a near-end dead zone of 10 meters. The battery provides up to eight hours of continuous operation. An AC adapter charges the battery pack while the MW9070A is operating, permitting continuous measurements with no downtime for battery charging. An external 12 VDC power source, such as a car battery, also can be used.

Manual measurements include: real-time sweep, two point distance and loss, two point loss per unit length, return loss, and splice/connection loss modes.

The mini OTDR measures 194 mm (height) x 290 mm (width) x 75 mm (diameter) and weighs 7 pounds. It is designed for outside plant use. The MW9070A is weatherproof and meets or exceeds military specifications for shock, vibration, dust and water.

The product is available in a 1,310 nm single-mode or 1,310/1,550 nm dual wavelength single-mode version. Multimode modules are being developed.
Reader service #198

Sectrum analyzers

(Continued from page 69)

"export," and then "import" the results file into the worksheet. With all the measurement results residing in the worksheet, displaying or printing a report is simple. To display a report listing the worst results for all measurements associated with the worksheet, click on the "status" button on the button bar. (Figure 13 on page 68 shows the "status report.") To make a hard copy for your files, just click on "print."

The status report is simply a summary of measurements. For example, a reported alarm limit violation for CSO might indicate a -20.3 dBc level, but it doesn't indicate which location relative to the carrier caused the violation. That level of information resides in the "results detail" window (Figure 14 on page 68).

Results detail also provides the means to browse the accumulated history of measurements, as well as navigate up and down the worksheet through channels or across the worksheet through the various measurements. View violations, also selectable from the status report window, displays each violated measurement on every channel, not just the worst channel for each measurement as on the status report. If you select "include history" in the status report screen, then multiple violations for each channel, if they've occurred, will appear (Figure 15 on page 68). Printing any of these reports requires nothing more than clicking on "print."

Exhaustive analysis

Statistical analysis of system parameters can point out deteriorating trends in performance. Catching such trends early, before you suffer any catastrophic equipment failure, will help keep your system on-line. PC spreadsheet programs are effective tools for statistical data analysis. Getting the contents of a worksheet into a Windows-based spreadsheet that can perform further analysis is simple.

The "copy" command, found in the edit menu (Figure 16 on page 68), can copy the entire contents of a worksheet (all measurement results) to the Windows clipboard, temporarily storing the data for transfer to your PC spreadsheet.

After starting or switching to a spreadsheet program, select the first cell in the spreadsheet and press shift-insert to paste the contents of the clipboard (worksheet data). The worksheet data in the clipboard flows into the cells of the spreadsheet in a logical fashion, as Figure 17 on page 68 shows. **CT**

Decisions, decisions

(Continued from page 21)

Insertion gear is not generally plug-and-play and you will need their help sooner or later. Also, recognize that support is not the best category to slight when trying to reduce the overall cost. The money saved won't be of much help when ESPN goes down right before an NFL game.

Conclusions

Clearly, many options exist for anyone purchasing insertion gear today. For the startup advertising operation, the cross-channel promoter and lovers of simplicity, sequential analog gear seems the obvious solution. For larger ad sales operations, shared random insertion using analog playback is the low-risk traditional choice. But, for those who hate 3/4-inch decks or want to build very large systems, digital is the place to be. That is, whenever it is finished.

Bear in mind, though, that the ad insertion industry is in a tremendous state of flux, and today's solutions may be cast in a very different light tomorrow. Make your choices for the long haul, be sure you have an upgrade path, and don't forget to cross your fingers. **CT**

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. Nonmembers must add 20% when ordering.

- *SLMs: The Technician's Edge* — An in-depth discussion of signal level meters and what they are, what they measure and how they work. It further provides a hands-on overview of the features and operation of the most advanced meters of today. (100 min.) Order #T-1135, $25.

The following videotapes were produced at Cable-Tec Expo 1993.

- *New Technologies and Their Effects on the Subscriber* — This program, featuring Claude Baggett, Vito Brugliera, James Farmer, Judson Hofmann and Michael Smith, discusses consumer demand for delivery of other types of communications services, the challenges they pose and the revenue potentials they promise. Topics covered include: legislative impacts, consumer electronics influences, computer industry impacts, telephone company competition, new consumer interface technology, new set-top technology and whole house descrambling. (75 min.) Order #T-1139, $45.
- *Pay-Per-View Technology Update* — This program, featuring Paul Harr, Paul Levine, Geoffrey Roman and Terry Wolf, address what services will look like in the future with video moving into the digital age. Topics include: digital compression, fiber optics, video-on-demand/movies-on-demand, possibilities with digital compression, headend logistics and control options. (1 hr.) Order #T-1140, $45.
- *Safety: NEC, NESC and OSHA Regulations* — Your system is subject to heavy fines if you don't have a written policy concerning all aspects of general safety as well as a hazardous materials program. Ralph Haimowitz, Jim Stilwell and Chris Story discuss safety, NESC and NEC requirements. Topics covered include: steps to OSHA compliance, required record keeping, OSHA inspection, most often cited OSHA standards, NESC spacing, ice/wind loading, Span Master program and NEC overview. (70 min.) Order #T-1141, $45.
- *Outage Reduction Techniques* — What are our current customers telling us about their need for greater reliability? This presentation by Scott Bachman, Chuck Harris and Mike Miller reports on research conducted by CableLabs and major MSOs. Low-cost techniques for better predicting and identifying potential outages/problems also is discussed. Topics covered include: link between outages and customer satisfaction, number of outages, and automated detection and tracking. (70 min.) Order #T-1142, $45.

Note: The videotapes are in color and available in the 1/2-inch VHS format only. They 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 videotape or book. 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 (610) 363-5898.

Listings of other publications and videotapes available from the SCTE are included in the April 1994 issue of the Society newsletter, "Interval."

CALENDAR

April

11-12: OSHA Voluntary Compliance Safety and Health Course, Dallas. Contact Safety Consulting & Training Inc., (319) 498-4517.

12: Society of Cable Television Engineers OSHA/Safety training seminar for system managers and safety coordinators on maintaining records and developing safety training programs, Holiday Inn, Philadelphia. Contact SCTE national headquarters, (610) 363-6888.

12: SCTE Desert Chapter seminar, video and audio signals and systems, San Gorgonio Inn, Banning, CA. Contact Greg Williams, (619) 340-1312, ext. 277.

12: Hewlett-Packard CATV measurements course, Ft. Lauderdale, FL. Contact (800) 472-5277.

12: SCTE Southeast Texas Chapter seminar, Installer and BCT/E exams to be administered, Warner Cable office, Houston. Contact Rosa Rosas, (409) 582-4855.

12: SCTE Central Indiana Chapter seminar, BCT/E exams to be administered, Columbus, IN. Contact Al Orpurt, (317) 825-8551.

12-14 SCTE Wheat State Chapter testing session, BCT/E exams to be administered, Multimedia office, Wichita, KS. Contact Jim Fronk (316) 792-2574.

13: SCTE Bluegrass Chapter testing session, BCT/E exams to be administered, Elizabethtown, KY. Contact Alan Reed, (502) 389-1818.

13: SCTE Central Indiana Chapter testing session, BCT/E exams to be administered, Monticello, IN. Contact Al Orpurt, (317) 825-8551.

13: SCTE Central New York Meeting Group seminar, BCT/E Category IV, Ramada Inn, Syracuse, NY. Contact Vince Cupples, (315) 452-0709.

13: SCTE Coastal Carolina Meeting Group seminar, Holiday Inn, Kinston, NC. Contact Larry Huffman, (919) 353-3500.

13: SCTE Delaware Valley Chapter testing session, BCT/E exams to be administered, The Williamson Restaurant, Willow Grove, PA. Contact Bob Lauer, (215) 876-5000.

13-15: Society of Cable Television Engineers Technology for Technicians II Seminar, hands-on technical training program for broadband industry technicians and system engineers, Holiday Inn, Philadelphia. Contact SCTE national headquarters, (610) 363-6888.

14: Society of Cable Television Engineers Satellite Tele-Seminar Program, *System Sweep, Part 1*, to be shown on Galaxy I, Transponder 14, 2:30-3:30 p.m. ET. Contact SCTE national headquarters, (610) 363-6888.

Planning ahead

May 22-25: National Show, New Orleans. Contact (202) 775-3669.

June 15-18: SCTE Cable-Tec Expo, St. Louis. Contact (215) 363-6888.

July 10-13: New England Cable Show, Newport, RI. Contact (617) 843-3418.

July 13-17: Colorado Cable Show, Vail, CO. Contact (303) 863-0084.

Aug. 1-3: Eastern Cable Show, Atlanta. Contact (404) 252-2454.

Sept. 18-23: Great Lakes Cable Expo, Indianapolis. Contact (317) 845-8100.

14: SCTE Gateway Chapter seminar, fiber in the field, Overland Community Center, Overland, MO. Contact Duane Johnson, (314) 272-2020.

14: SCTE Music City Chapter seminar, Ramada Inn, Nashville, TN. Contact Bill Goodwin, (615) 244-7462, ext. 406.

14-15: OSHA Voluntary Compliance Safety and Health Course, Tulsa, OK. Contact Safety Consulting & Training Inc., (319) 498-4517.

14-15: Scientific-Atlanta training session, addressable interdiction, Atlanta. Contact Bill Brobst, (404) 903-6306.

18-21: OSHA Voluntary Compliance Safety and Health Course, Denver. Contact Safety Consulting & Training Inc., (319) 498-4517.

19: Hewlett-Packard CATV measurements course, Kansas City, MO. Contact (800) 472-5277.

20: SCTE Badger State Chapter seminar, basic telephone, Holiday Inn, Fond du Lac, WI. Contact Brian Revak, (608) 372-2999.

20: SCTE Dakota Territories Chapter seminar, distribution systems, Watertown, SD. Contact Michael Schmit, (605) 229-1775.

20: SCTE Heart of America Chapter testing session, BCT/E exams to be administered, Kansas City, MO. Contact David Clark, (913) 599-5900.

20-21: Scientific-Atlanta training session, fiber-optic networks, Boston. Contact Bill Brobst, (404) 903-6306.

21: SCTE Dakota Territories Chapter seminar, distribution systems, Bismark, ND. Contact Michael Schmit, (605) 229-1775.

21: SCTE Southern California Chapter seminar, installation: tap-to-TV, Alhambra, CA. Contact Tom Colegrove, (805) 252-6177.

22: Hewlett-Packard CATV measurements course, Chicago. Contact (800) 472-5277.

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**.

The Future Of Communications Is Here.

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As an internationally recognized Fortune 500 company based in Chicago, we're constantly expanding the boundaries of telecommunications. That's why we're the industry leader. And why we're at the forefront of video interactive services. If you have a pioneering spirit and thrive on challenge, here's your opportunity to excel in one of the following positions.

CONSTRUCTION MANAGER

Responsible for overseeing construction start-up activities for our new Video Interactive Services. You will staff, train, organize supplies and equipment, and manage cost and performance for the entire project, as well as monitor and select outside contractors. Requires construction operations and management knowledge and a technical knowledge of current and future video equipment and processes. Excellent communication skills are essential. ***(Reply to Dept. LH-CM)***

ENGINEERING MANAGERS

All Engineering Manager positions require an MSEE or equivalent, familiarity with LAN's, WAN's or MAN's for voice, data, image and full-motion video and a detailed knowledge of analog and digital technologies.

VIS NETWORK MANAGEMENT SYSTEMS

You will start-up, plan, engineer, integrate, procure and manage systems for administration and "end-to-end" monitoring of all aspects of the VIS technical infrastructure from information provider to end-user. This will involve organizing a team to respond to VIS needs. Requires a detailed knowledge of current and emerging network management techniques—ISO/OSI emerging standards and OSF are essential. Knowledge of SNMP, CMIS/CMIP, "heart beat" and CNM is essential. ***(Reply to Dept. JF-NMS)***

VIS ARCHITECTURE AND PLANNING

Responsible for the engineering, specification, deployment and management of services, systems and equipment to support the routing of audio, data, image and video for Video Interactive Service Applications. A knowledge of Ethernet, Token Rings, MAP/TOP, TCP/IP, ISO/OSI, ISDN, FDDI, STM, ATM. SONET. HDSL, ADSL and MPEG is essential as well as working knowledge of analog and digital switching and transmission. ***(Reply to Dept. JF-AP)***

VIS SERVER, TERMINAL AND INTERFACE SYSTEMS

While assisting with the start-up activities for VIS deployment during 1994, you will engineer, specify and manage network and terminal gateways and interfaces from the server to local and remote networks for distribution of VIS, as well as organize a team to respond to VIS needs. Requires a detailed knowledge of analog and digital interface systems. ***(Reply to Dept. JF-TIS)***

VIS PLANNING & ENGINEERING DESIGN

You will be involved in network design planning, engineering design management and engineering budget management for VIS transport network. This will involve leading a team to design the VIS transport system, providing VIS engineering direction, managing system deployment and developing capital and engineering resource budgets. Requires a detailed knowledge of OSP network planning and engineering design, an understanding of fiber, video and telephony, and RFP analysis skills. We also expect a high energy individual with strong negotiation skills. ***(Reply to Dept. JF-PED)***

OPERATIONS MANAGERS

You will plan, track, analyze service levels, force levels and cost for Customer Service. This will involve building a consolidated operations plan, developing budget models for each work team and resolving internal and external customer service problems. Requires a detailed knowledge of customer service operations and management, experience in work force sizing and organizational cost management. PC skills in data collection, modeling systems and spreadsheets are essential. ***(Reply to Dept. DM-OM)***

OPERATIONS MANAGERS - NETWORK FACILITIES

You will plan, test, accept, maintain and manage data transmission media for VIS. Responsibilities will involve developing design requirements, organizing a work force and insuring VIS compliance with state and federal regulatory codes. Requires a detailed knowledge of the engineering, operations and management of LAN's, MAN's and WAN's; experience with narrowband, broadband, analog and digital switching; and management experience. ***(Reply to Dept. JF-NF)***

CUSTOMER SERVICE MANAGER

You will plan and manage on-going operations for all customer service installation and repair processes for VIS implementation. This will involve forming an installation and repair operations team, as well as negotiating contracts for OSS to build a maintenance and dispatch operation. You will provide all project management controls for this phase of VIS. Requires a detailed knowledge of customer service Installation and Maintenance operations and management, dispatch operations and service analysis processes and systems. Experience in work-force sizing, organizational cost management and value-driven performance is essential. ***(Reply to Dept. DM-CSM)***

PROJECT SUPPORT MANAGER

You will manage the operations development, network construction and service implementation of VIS. This will involve developing time frames, determining resources required, defining work tasks and tracking responsibilities and costs. You will also set up a tracking support system, an action register and a communications structure. Requires major network deployment knowledge and experience in project management techniques and tools. A background in RFP process is helpful. ***(Reply to Dept. DM-PSM)***

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Fiber geometry and handling

In a previous column, our fiber expert addressed questions about optical fiber handling and examined what cable TV technicians can do to optimize fiber performance and ensure reliability. This month he answers questions regarding fiber geometry (the physical dimensions of the fiber) and what the fiber manufacturer can do to make fiber handling easier for installers.

By Douglas E. Wolfe
Senior Applications Engineer
Corning Inc.

I'm spending a large portion of my fiber cable installation budget on splicing. How can I improve splice loss and keep splicing costs to a minimum?

There are several ways to reduce splice loss without sacrificing your budget. First, be sure to follow recommended handling procedures. Cable TV technicians have a great deal of influence on fiber reliability during installation and splicing.

Second, consider the impact of fiber geometry on splice loss and efficiency. Although advanced splicing techniques have driven down overall installation costs, fiber geometry continues to play a key role in optimizing splice results.

Fiber that exhibits tightly controlled geometry tolerances is easier and faster to splice, ensuring predictable, high-quality performance. Combined with efficient splicing techniques, tighter tolerances can provide better results at lower costs. That means more splices are done right the first time, resulting in fewer remakes and bigger savings.

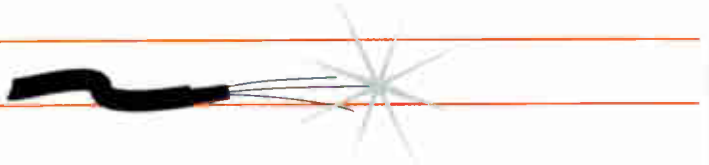
Which fiber geometry parameters are most important to me during splicing?

The impact of fiber geometry parameters can vary depending on the splicing technique used. However, rather than focus exclusively on a particular characteristic, cable TV companies should view fiber geometry as a complete technology package. Tighter tolerances usually indicate overall quality and consistency in all parameters, not just one.

There are three primary characteristics to consider when examining fiber geometry and its impact on splicing:

- **Cladding diameter:** The outside diameter of the cladding glass region.
- **Core/clad concentricity:** How well the core is centered within the cladding glass.
- **Fiber curl:** The degree of curvature along the fiber axis.

To ensure conformance at any splice termination point,



"To ensure conformance at any splice termination point, each parameter must be controlled along the entire length of the fiber."

each parameter must be controlled along the entire length of the fiber. All of these parameters can contribute to core offset, a major contributor to splice loss. This is especially important when using splicing technologies that rely on the physical dimensions of the fiber, including fixed V-groove alignment, sizing ferrules or matching field-installable connectors. When two fibers are joined together, large differences in cladding diameter, core/clad concentricity or fiber curl can result in core offset. This prevents the fiber cores from aligning properly during splicing and potentially could lead to higher splice loss. What follows are further details on the definitions listed previously:

- **Cladding diameter**: The outer cladding diameter refers to the size of the fiber after its protective coating has been removed. Tighter cladding diameter tolerances help to ensure that fibers are almost exactly the same size. Cladding diameters must be consistent in order to align fibers for connection and avoid core offset.
- **Core/clad concentricity:** The core/clad concentricity is defined as the distance in microns (10^{-6} m) between the center of the core and the center of the cladding glass.

Even when the fibers are the same size, their cores still may not align properly if there is excessive core/clad concentricity. As with cladding diameter, core/clad concentricity can become a major contributor to splice loss.

Tightly controlled core/clad concentricity ensures that the fiber core is centered in the cladding glass. This greatly reduces any chance of core misalignment during splicing, yielding a better, lower-loss splice.

- **Fiber curl:** Fiber curl describes the degree of curvature along the fiber axis. Although curl exists to some degree in all fibers, excessive amounts of curl can complicate fiber alignment when splicing multiple fibers together (mass splicing). This could lead to high splice loss and poor splice yields.

Fiber curl was not an issue for manufacturers until the arrival of mass fusion splicing technologies. Since fiber curl tends to have a greater effect on splice loss when splicing multiple fibers rather than single fibers, manufacturers now must monitor and control contributing factors to ensure improvements in fiber curl. These process improvements will have a major impact on cable TV MSOs, should they decide to use mass fusion splicing in the future. **CT**

SCTE committees meet at Texas Show

By Bill Riker
President, Society of Cable Television Engineers

Three committees responsible for guiding future directions of the Society met on Feb. 22 and 23 in conjunction with the Texas Show in San Antonio. These included the Training Committee, the Planning Committee and the Engineering Committee. The following is a summary of activities undertaken by each group during their respective meetings.

Training committee

In attendance at the Training Committee meeting were Pam Nobles (chairperson) of Jones Intercable, Don Oden of the National Cable Television Institute, and Ralph Haimowitz and Marv Nelson, both of SCTE. This committee, responsible for the Society's Certification Programs and matters related to technical training discussed the Broadband Communications Technician/Engineer (BCT/E) curriculum, health and safety training, installer certification, publication/videotape development and consumer education.

The meeting began with a discussion on an organizational chart of the committee's subcommittees and working groups. A review of the communication efforts between the committee chair, members and subcommittees resulted in priorities being set in order to maximize input of the committee members' expertise and involvement.

The subject of BCT/E curriculum was discussed, resulting in a consensus that there be more focus on certification programs, apart from existing curriculum subcommittees. Also, it was agreed that there is a need for a certification level between Installer and BCT/E Certification for service technicians in addition to partial certification. Regarding Installer Certification, discussion focused on the need for an "exam review working group" for the Installer Program, and possibly fusing certification curriculum working groups into one subcommittee.

In the area of health and safety, it was reported that the existing *Health and Safety Manual* has been well received, with chapters of the next edition in the editing stage. The OSHA manual is in the final edit stage and will be available by early summer. Ideas for updating the *Installer Manual* were discussed, resulting in a possible collaboration with NCTI to complete the project.

With regard to publication and videotape development, it was recognized that it is the responsibility of the Society as the "premier training organization of the cable industry" to ensure that the quality, creativity and technical presentation of its offerings be accurate. To this end, the committee agreed to appoint an overall chairperson with training experience to work on video production.

The committee's work with the Cable Consumer Electronics Compatibility Advisory Group is progressing. The group offers advice on compatibility between industry and consumer groups. Since CableLabs is working on a similar project, it was suggested that SCTE could collaborate with it on a video addressing the topic.

Planning committee

The meeting of the Planning Committee, responsible for gathering ideas and information that will guide the Society, was comprised of Steve Allen of Jones Intercable (chairman), Mike Aloisi of MTV Networks and myself.

We discussed a proposed "SWOT" program for the purpose of deciding how the Society can best serve the existing membership and attract new members by analyzing SCTE's strengths, weaknesses, opportunities and threats. It was noted that many of the objectives that were identified in our 1992 analysis have been met or are a work in progress, and the consensus of the committee was that we develop new objectives to reflect the changing nature of the industry and include input from the telco industry. Also it was decided to gather information on other training organizations for the purpose of promoting joint efforts. Some possibilities are SBCA, USTA, SBE, telephone pioneers and wireless cable.

The Cable Advertising Bureau is implementing a new data base on-line electronic communications system and we are seeking to have a significant amount of input into the formation and design of this network. The rationale is that our 11,500 members will represent a large portion of the network, and involvement in the early stages may eliminate the need to modify it to fit our needs after the fact.

Engineering Committee

Attendees at the Engineering Committee meeting included Wendell Woody (acting chairman) of Sprint, Keith Burkley, Gary Hamm and Dave Franklin of Time Warner, Charles Duff of Bumup and Sims, Dan Pike of Prime Cable, Brian McMillan of Sprint, Paul Arvin of TCI and myself. Responsible for the standards and recommended practices activity of the Society, the committee's discussion focused on CATV symbology and ANSI.

After reviewing a proposal for a design template covering fiber-optic symbology to be produced by Channell Commercial, I reported that representatives from the SCTE and National Cable Television Association engineering groups had negotiated a final set of fiber-optic symbols. The committee voted unanimously to adopt the proposed symbology.

The current process undertaken by SCTE in becoming a standards developer for ANSI was discussed. Paperwork was submitted to ANSI in January and we are awaiting the results of that application. However, as a member, the Society is now being asked to comment on other standards under consideration by ANSI. It was decided that SCTE national headquarters would forward proposed standards relating to the telecommunications industry to the Engineering Committee for its review.

The activities highlighted in this column were to be reviewed by the national board of directors at its meeting on March 22. Following that, the next full meeting of the board will take place in St. Louis on June 14 prior to Cable-Tec Expo '94. **CT**

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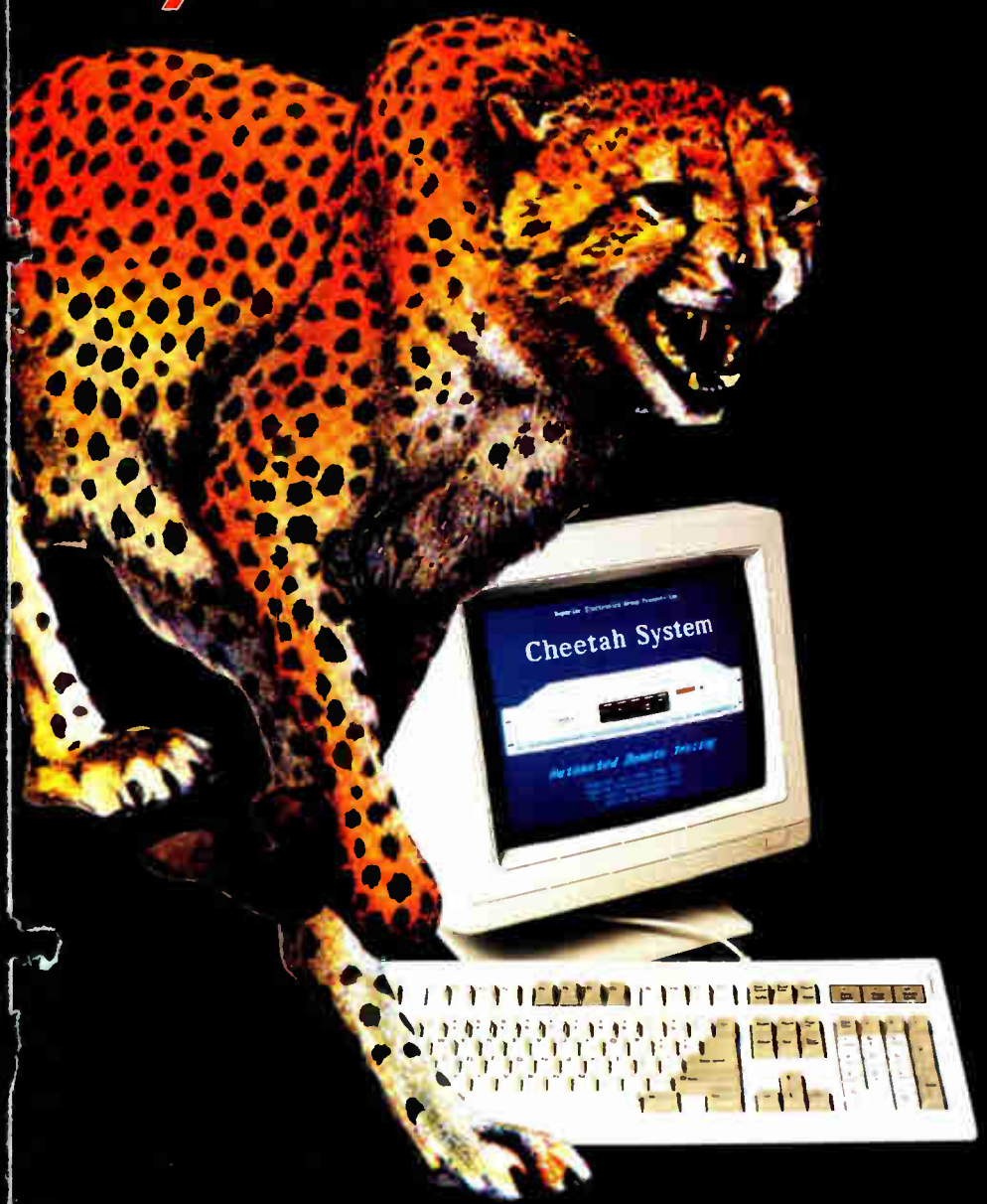

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Reader Service Number 84

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