
Communications Technology
30th
1969-1999
OFFICIAL TRADE JOURNAL OF THE SOCIETY OF CABLE TELECOMMUNICATIONS ENGINEERS
NOVEMBER 1999
PLANNING 2000
PART 2
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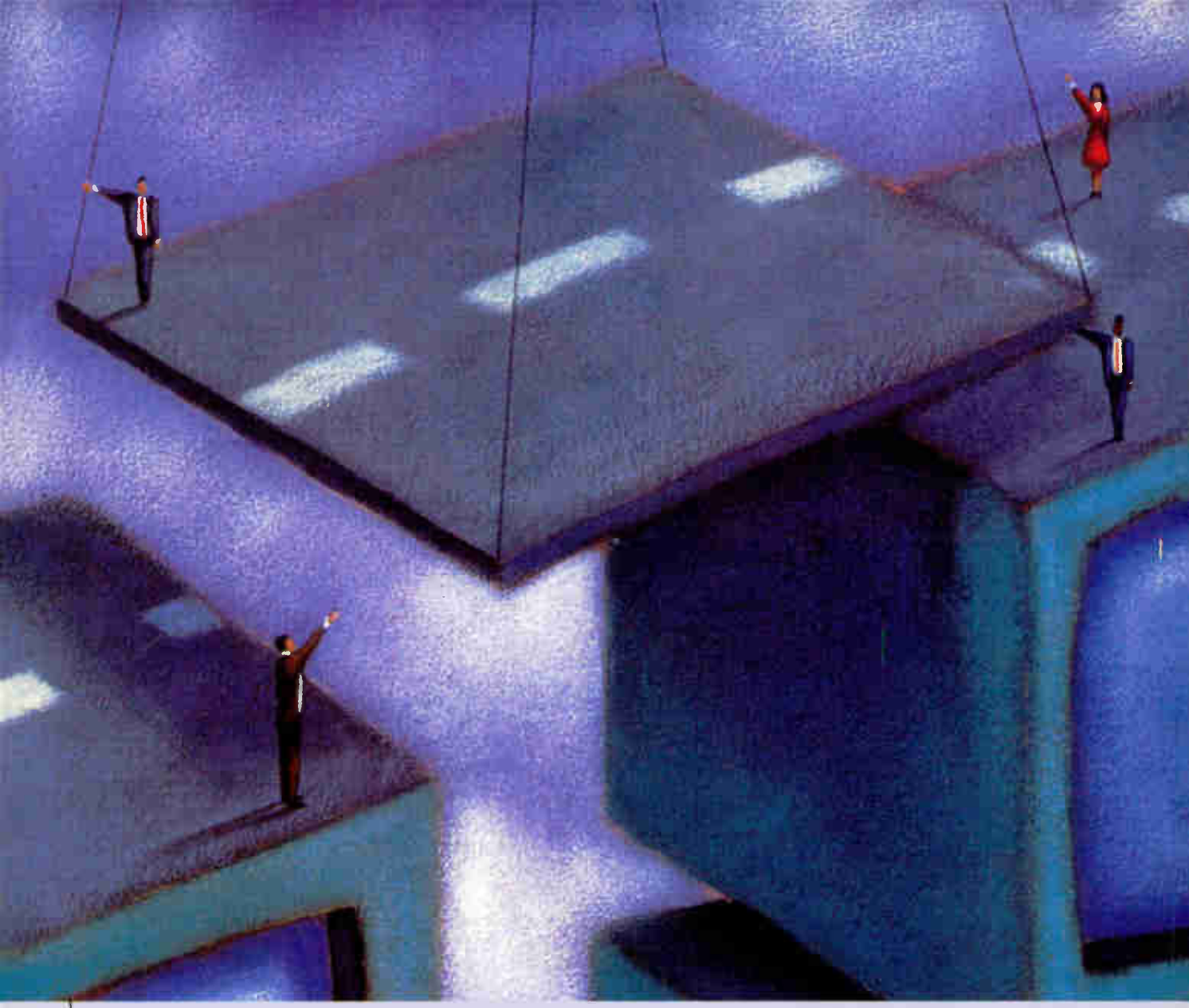

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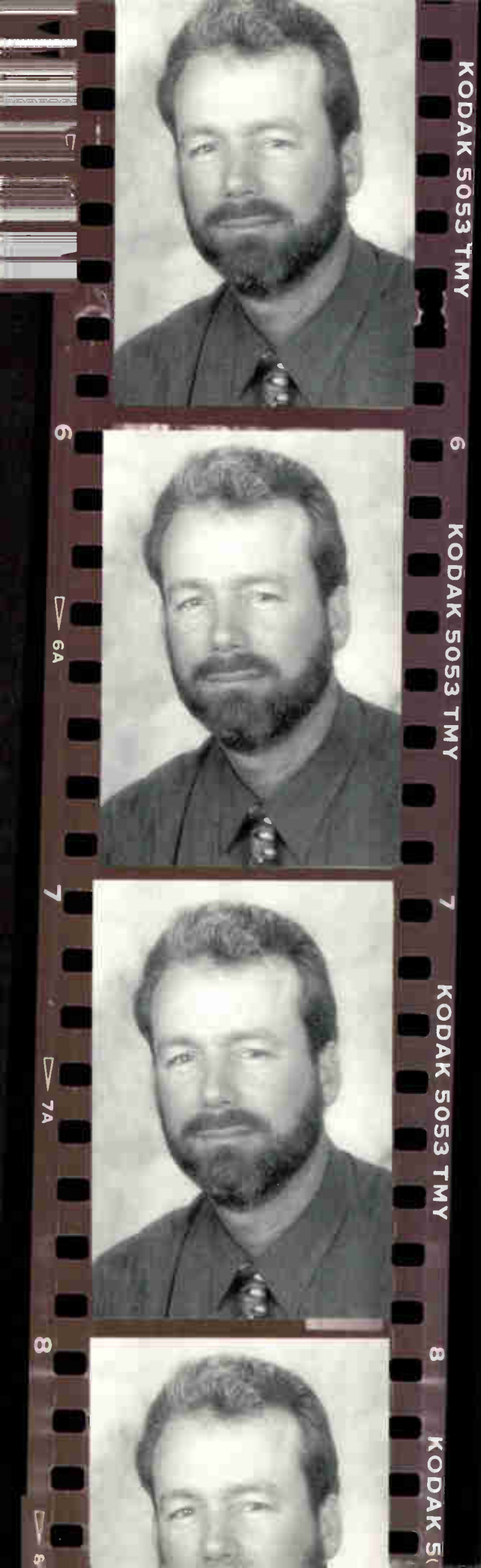

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"Make sure your technical management team is reading CT."

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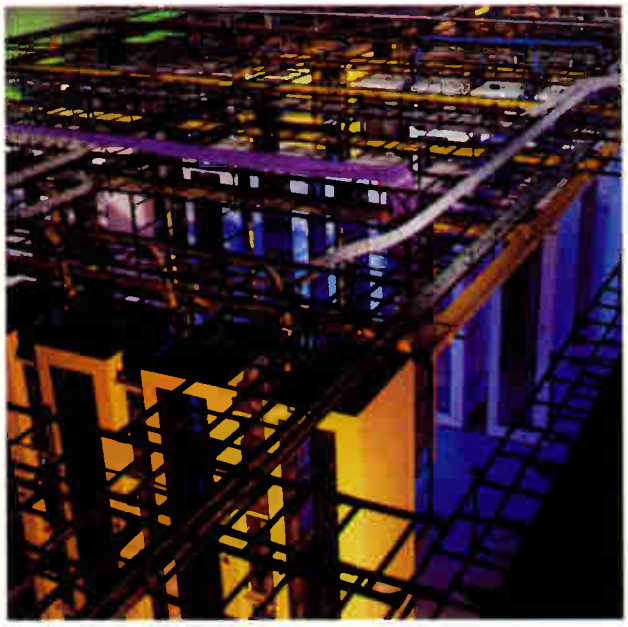

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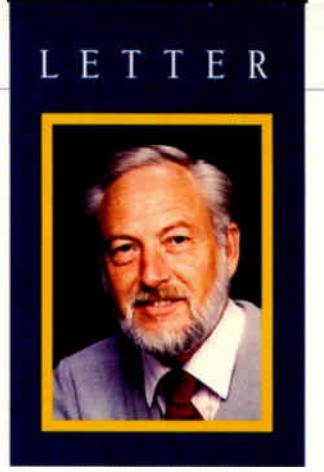
Reader Service Number 4

By Rex Porter



Marketing Opportunities?

The other day, I was sitting in a theater waiting for the movie to begin. The theater was almost completely full of people—we were, for all intents and purposes, a captive audience. As we sat there, advertisements via slides were shown on the screen. In fact, I probably saw the same advertisement two or three times.

Then a "leader" film was run by some company to promote a new product guaranteed to make me taller or something. I was ready for the previews, but this promotional film, inserted before the previews, caught my attention. And I wondered, "Why not use this same idea to promote all of the new services provided by local cable systems?"

In front of a captive audience, cable could demonstrate high-speed cable modem service. We could compare speed. We could illustrate Internet home pages. And we certainly could ask the question, "Are you tired of being disconnected from your Internet service provider (ISP) every five minutes?"

I've also wondered why programmers, who allow ad insertion over these very cable systems, haven't approached the multiple systems operators (MSOs) and local operators proposing to allow a number of ads that tout new cable services such as high-speed Internet access, telephony and digital services.

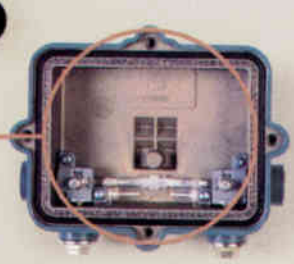
Why would promoting the local Ford dealer (or whatever the case might be) be more important to cable operators than promoting their own systems' modernization? Perhaps the National Cable Television Association could provide the ad segments for our industry.

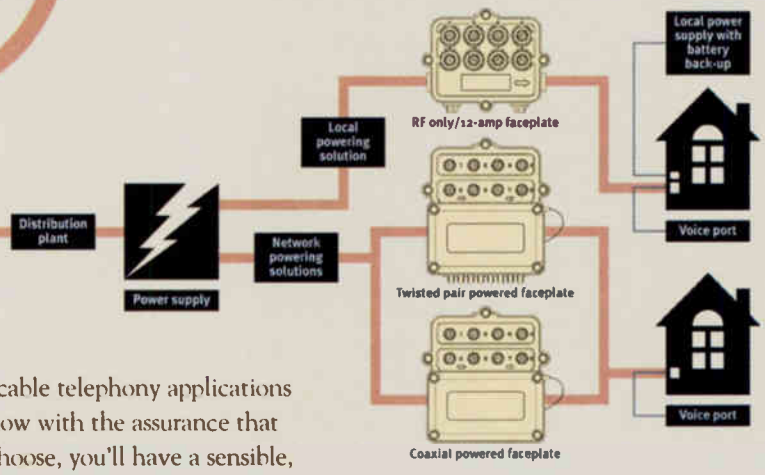
If I were running a programming service and trying to increase the number of systems and MSOs using my channel, I think I would get the edge on any competition by perhaps offering this opportunity. We own the pipe into everyone's home. And everyone else wishes they owned that pipe. Perhaps we aren't making the best possible use of it.

If you wonder why marketing is any concern of a "technical magazine" such as *Communications Technology*, just remember that we are concerned with any ideas that will increase the use of the wonderful technology we cover each month. We'd like to hear your ideas.

Rex Porter
Editor

3 faces 1 body 0 worries





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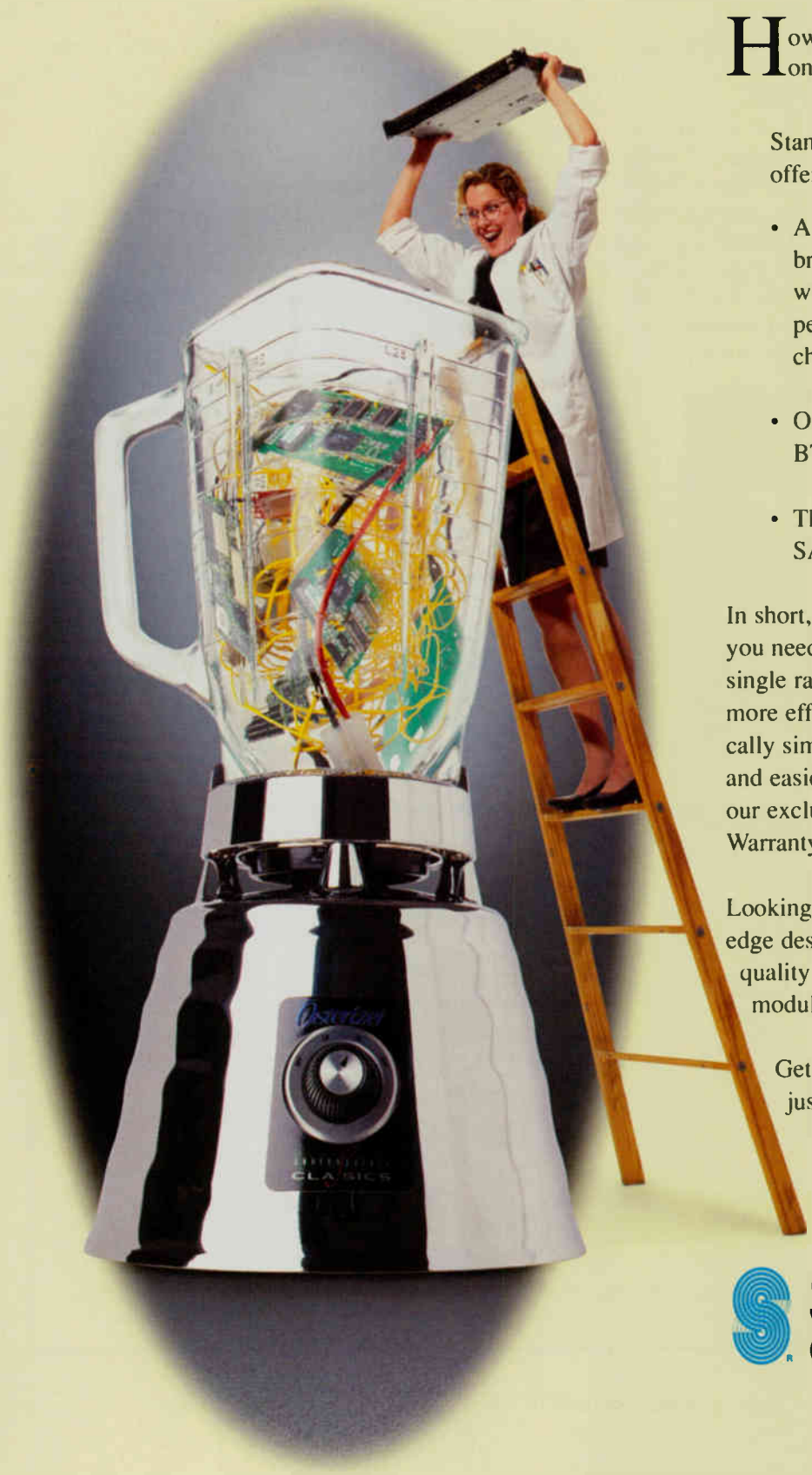
How Standard blended four big capabilities into one little modulator.



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Reader Service Number 8

GI, Motorola to Form A More Perfect Union

By Doug Larson

You've heard the "who" and the "what:" Semiconductor magnate and No. 2 cell phone manufacturer Motorola has made a bid for No. 1 set-top maker General Instrument in a deal valued at $11 billion.

The "why" has become clearer since rumors of the impending merger hit the streets in early September. In short, much of the deal boils down to brands and customers. Motorola, which has entered the cable market with its CyberSURFR cable modem but has yet to reach CableLabs Certified status, acquires access to GI's Data Over Cable Service Interface Specification (DOCSIS)-compliant SURFboard 2100 cable modem and supporting technologies. On the customer end, the deal opens doors for Motorola at companies such as AT&T, Time Warner, MediaOne, Comcast, Cox, Adelphia, Shaw, Jones, Charter, Suburban Cable, Intermedia Cable and Bresnan, which have a collective subscriber base of more than 46 million and where GI currently is an approved supplier.

Photo courtesy of General Instrument

Most significant on the list is the former TCI, which along with its affiliates accounted for 31 percent of GI's consolidated net sales in 1998 and which serves more than 10,000 subscribers. At press time, *The Wall Street Journal* had reported a rumor that AT&T Corp. was planning to buy 2 million set-top boxes from GI and an unspecified number of cable modems from Motorola in a deal valued at $1 billion—not a bad way to kick things off.

GI, a veteran vendor to the operator community but lacking a strong retail brand name, gains a partner widely known in the consumer space, a move that will help the box maker as the CableLabs Certified retail effort gathers momentum.

"We think there's ... three centricities in the world. Some people see the world in the home as being a PC (personal computer)-centric world, others see it as a broadband access device on the outside of the home, and others frankly see it as a set-top box centricity," said Dick Day, corporate vice president and general manager of Motorola's Multimedia Group. "They all can't be wrong, and now we have bets placed on all of those different centricities."

The merger also could accelerate both companies' entry into areas where to date they have only dabbled, such as In-

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ternet protocol (IP) telephony and home networking.

"My view is we've got some areas we've probably pioneered a little further than GI, and I think they've taken some areas and pushed them pretty nicely as well. The real opportunity we have now is to get the resources synergized and linked together and make all of this just happen faster," said Bruce Stone, senior vice president of Motorola's Multimedia Group. GI previously had consolidated its high-speed cable modem effort with its nascent IP telephony business, including work on the DCT 5000+, a variant of the SURFboard modem.

Under the new organization, GI will be structured into Motorola's Communications Enterprise group, with GI Chief Executive Officer Ed Breen heading the new business unit and reporting to Merle Gilmore, president of the Motorola's CE group. Motorola's Multimedia Group, which includes Motorola's cable business, also will fold into the CE group.

Although Scientific-Atlanta Chief Executive Officer James McDonald says his company is prepared to go it alone, the GI/Motorola announcement has led to speculation that suitors for Scientific-Atlanta, the No. 2 set-top box maker, may also be waiting in the wings. ➤

Two-Way or the Highway

Turnkey high-speed access provider ISP Channel says it now will concentrate exclusively on providing service to systems that have upgraded, or are planning to upgrade, to two-way capability. Prior to the decision and the addition of Mediacom systems in July, which brought its footprint to 2.4 million homes passed, fewer than one third of the ISP Channel homes passed met that criteria; that number is now nearly two-thirds.

The broadband Internet service provider (ISP), which targets second-tier independent and multiple systems operators (MSOs), expects the new focus to streamline its business and improve its bottom line.

"Our focus on two-way systems will result in major savings by not having the added telephony return costs or customer service issues associated with one-way," said Garrett Girvan, SoftNet's chief operating officer. Telephony return expenses include the cost of connecting to the public switched telephone network (PSTN), which is necessary to service dialup customers as well as to provide the upstream link to the ISP Channel's headend equipment from cable modem customers located in one-way systems.

This announcement complements SoftNet's acquisition in February of Intelligent Communications, a provider of two-way satellite Internet access using very small aperture terminal (VSAT) technology, which will lower the costs of providing Internet access to small- and medium-sized independent cable operators located in rural areas. Intellicom's VSAT network provides coverage throughout the lower 48 states as well as in southern Canada, southern Alaska, Puerto Rico, Latin America and the Caribbean.

Although turning its back on a potential customer base, ISP Channel says the move will not affect the total number of ISP Channel marketable homes passed (systems under contract) and will not impede future growth.

"We are seeing penetration numbers that are two to four times higher in our two-way systems vs. those one-way systems, which use a telephone line to return traffic from the customer's computer to the Internet," says Girvan.

A deal with RadioShack whereby the retail outlet chain will demonstrate and sell ISP Channel Internet services likely will boost subscriber growth; RadioShack operates in approximately 80 percent of ISP Channel service areas.

Perfecting Our Leakage Meters Meant Moving One Important Part—You.

Now you know exactly where to go. Because finding and fixing cable leaks just got a whole lot easier, faster, more accurate – even more fun. We've completely redesigned our leakage antenna system to provide unparalleled sensitivity and direction finding, so you can follow that elusive leak into any nook and/or cranny to get your job done more efficiently than ever. This new HD-1 antenna, combined with our new Find and Fix firmware and advanced tagging capability, provides the most comprehensive leakage test system available. Did we mention we're giving the newly designed HD-1 antenna away with every unit we sell until March 1? It's true. Just call your local sales rep or visit ***www.wwgsolutions.com***. You can also call **1-800-851-1202** for a free leakage system information packet.

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Reader Service Number 12

ViaSource Goes On Buying Spree

When ViaSource Communications goes shopping, it apparently doesn't like to come home empty-handed. On a recent trip to the market, ViaSource purchased field service specialist Communications Resources Inc.; RTK Corp., one of the largest independent providers of field services to the telecommunications industry; and Denver-based Telecrafter Services Corp., which offers contract services including installations, system audits, direct sales and collections. The company says the acquisitions were part of an effort to expand its capabilities to offer a national technical service outsourcing platform and open up new sales channels.

From the looks of it, they fared pretty well. The acquisitions now give the wiring conglomerate a client base of 50 of the top 100 cable systems in the United States, including AT&T and Time Warner.

"We've combined the 'best-in-class' in field service and fulfillment to create a company that offers specialized skill sets and high-caliber management nationwide," said Craig Russey, ViaSource president. "We are elevating the standards of service delivery for the communications industry by creating a geographically diverse, client-diverse and product-diverse company that is dedicated to our clients and the customers they serve."

Russey estimates the company's 2,200 employees visit nearly 15,000 homes a day, making customer contact on behalf of its client base the most crucial aspect of ViaSource's delivery function. "We understand that systems are valued by homes passed," said Russey. "Because ViaSource specializes solely in connectivity issues, we are instrumental in maximizing a system's value, both in terms of value to shareholders and value to the users."

Left to right: ViaSource executives Craig Russey, Bruce Nassau, Bill Sprague and GE Capital's Tom Waters

CableLabs to Enter E-Commerce?

With the "DotCom" craze in full swing, it will come as no surprise that CableLabs is jumping into the game with the launch of an Internet-based electronic commerce site. CableLabs says its site, dubbed the "service locator" for the cable industry, will assist computer makers and retail partners in selling cable modems and other consumer equipment by making

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Reader Service Number 14

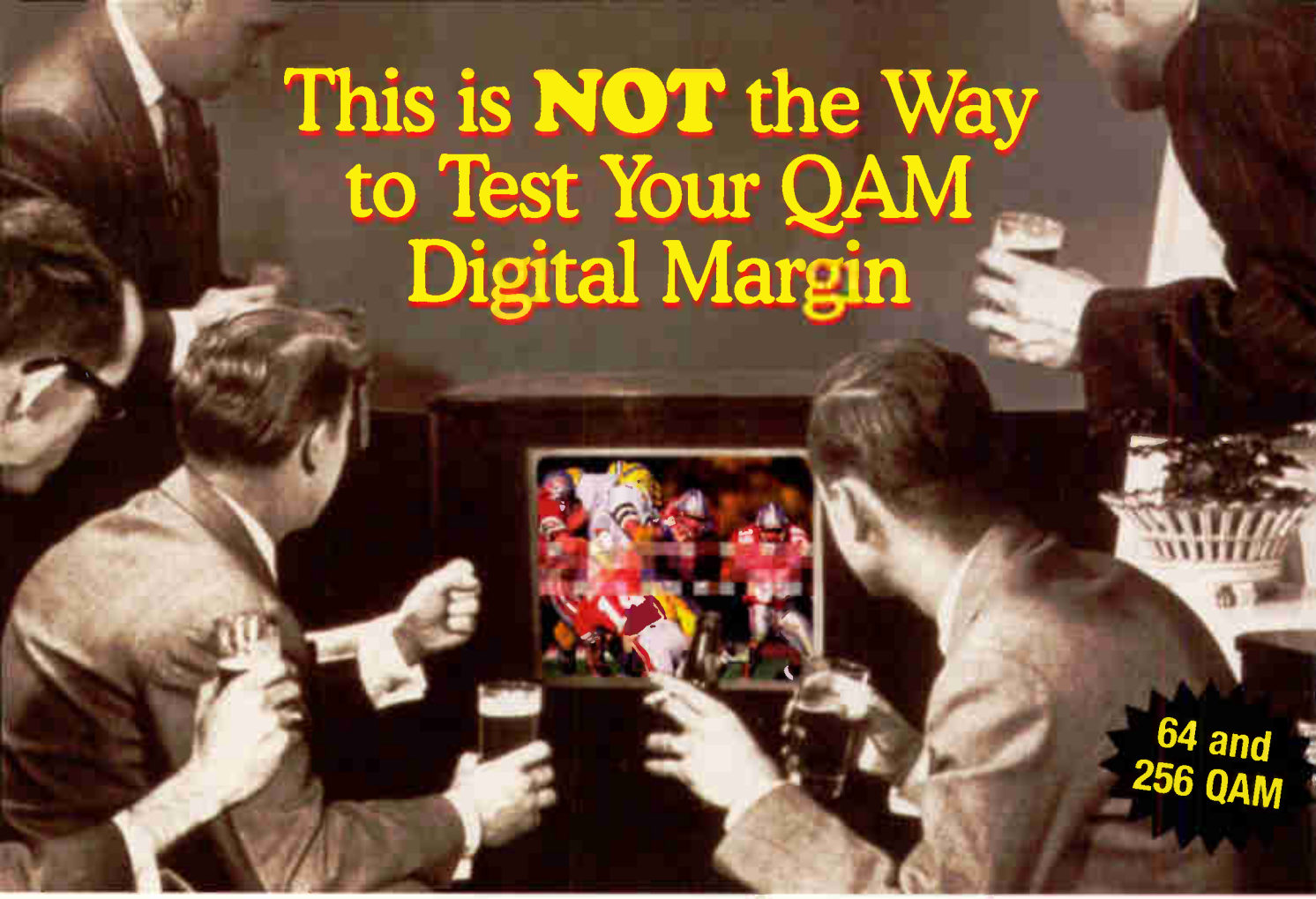
available to them a database of North American cable modem service areas.

"We want to help the consumer make an informed retail purchase," said Carl Vogel, executive vice president and chief operating officer for Field Operations with AT&T B&IS. "If a consumer wants to buy a computer made by Company X, that company's sales representative could use this database to advise the customer on the availability, to provide that customer with high-speed Internet access in his cable system."

While the specific details of the proposed site have yet to be finalized, CableLabs expects the service to be up and running in the near future.

NEWS BITES

- Time Warner Cable has selected Toshiba America Information Systems to supply its Data Over Cable Service Interface Specification (DOCSIS)-certified cable modems for Time Warner's new Road Runner broadband Internet services in New York City. Under the terms of the multimillion dollar contract, Toshiba will supply its PCX1000 cable modem to Time Warner's New York operations, which serve more than 1 million Gotham-area customers in Manhattan, Queens, Staten Island and portions of Brooklyn.
- Broadband Internet service provider (ISP) Excite@Home has bestowed Level 2 approval on General Instrument's SURFboard SB3100 cable modem, making GI the first vendor to receive Level 2 status for a DOCSIS 1.1 hardware-ready modem. Level 2 approval confirms that the SURFboard modems are interoperable with DOCSIS-based cable modem termination systems (CMTSs) and operation support systems (OSS) equipment.
- In its first major-market deployment by a top-five multiple systems operator (MSO), video-on-demand (VOD) provider DIVA will provide VOD services to MediaOne customers in select locations. The contract calls for the installation of DIVA's VOD hardware and enabling software, a controlled commercial trial, and subsequent full commercial launch. CT



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Digital Video can give your subscribers picture quality unmatched by analog technology. Unfortunately, with digital, there is a very small difference between a channel working and not working at all. A picture that looks perfect, may be only a couple dB away from breaking up. The Hukk CR1200 QAM Monitor can tell you for sure the quality of your installation, so you don't have to learn about it from angry subscribers.

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Reader Service Number 17

By Arthur Cole

Consolidation: Where Do You Start?

Fiber optics and advanced transmission technology finally are making it cost-effective to consolidate headends to create large regional networks. However, getting from point A to point B is not as easy as it sounds.

Multiple systems operators (MSOs) usually can complete the task in one fell swoop, but smaller players likely will pull systems in one by one to spread the cost out.

But which system should go first?

Where to begin?

For Insight Communications' Indiana operations, the logical choice was ad insertion. The company recently installed nCube's SkyConnect ad insertion system at its Anderson, Ind., facility, from where it will deliver spots to 20 headends throughout the region. The deal marks nCube's first major ad insertion deployment since it acquired SkyConnect.

Bill Gilbert, vice president of ad sales at Insight, said the move is the first step in a consolidation project that will result in a network serving some 40 small cities in Indiana from six headends.

Why start with ad insertion? With a single network now delivering a market almost as large as Los Angeles, Insight will be better able to draw national and regional ad spots, directly boosting the bottom line. That revenue then can be put toward consolidation of systems such as transmission and monitoring, which will help reduce costs. And there is the little matter of network digitalization, which requires considerable cash flow.

"The biggest growth potential for us is in national and regional business," Gilbert said. "We'll also be able to do a lot of cross-promotions for all the new services coming to our digital system."

The system also will allow Insight to take better advantage of Comcast's Indianapolis interconnect, which gives Insight access to nearly 250,000 subscribers.

Nuts and bolts

Insight's SkyConnect system consists of a Compaq AlphaServer scalable to 48 channels. The system will allow each headend to deliver 12 to 24 channels, far better than the four to eight channels that each headend has available today.

All traffic and billing will be handled at Anderson, a cost savings for Insight because it no longer needs traffic and billing hardware and personnel at each headend.

Spots will be Moving Picture Experts Group (MPEG) encoded at Anderson and five other locations that have local sales staff. The spots are transferred to the Anderson traffic system (via fiber links in the case of the five remote encoding sites) and are then routed to servers at each headend. Spots will be scheduled at the local headend, with run schedules wired to the main server in Anderson.

At the moment, only five of the headends are connected to Anderson by fiber. The remainder receive spots on 2 GB Jaz drives delivered by mail. Gilbert admits this is an inefficient system, but it beats the analog days when spots were delivered on tape. A single Jaz drive can hold up to 80 30-second commercials. As consolidation continues, all of the remote headends will be connected to Anderson by fiber.

Each headend is outfitted with nCube's MDS-420 decoder, which contains switching mechanisms, audio level adjustment, measurement and dual tone multifrequency (DTMF) detection in a single rack unit.

As with most digital ad insertion systems, SkyConnect lets Insight segment its market, targeting spots at different regions or consumer profiles. A digital system also offers quick turnaround in getting ads on the air and takes up much less space than the cart machines and videocassette recorders (VCRs) of old.

nCube is relatively new to ad insertion, with only six months or so under its belt following the SkyConnect purchase. nCube's main business is video-on-demand (VOD), but the company is planning to make the same use of the Compaq servers in the ad insertion market.

Now, wait a minute ...

In case you were wondering why a fiber/mail delivery system is called SkyConnect, John Boland, executive vice president of sales at nCube said the product originally was intended as a national satellite insertion system. However, the cost of satellite time proved too high, so the system was re-engineered.

Boland added that the satellite method has not been shelved for good.

"Now that price points are coming into line and satellite time is more reasonable, we are seeing renewed interest in that kind of business," he said. CT

Art Cole is a contributing editor to "Communications Technology."

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Confused About DOCSIS?
SCTE Comes to the Rescue

With new technologies rapidly changing today's cable industry, the knowledge and skills needed to deploy these services is crucial. This fall, the Society of Cable Telecommunications Engineers is offering several Data Over Cable Service Interface Specification (DOCSIS) training seminars to meet this need.

SCTE is presenting "DOCSIS Deployment," a full-day seminar to help broadband professionals better understand the elements, implementation, deployment and impact of DOCSIS. Through these seminars, independent cable operators and multiple systems operators (MSOs) will gain the knowledge to quickly and easily build, deploy and manage DOCSIS-compliant systems to deliver new services to their customers and expand their existing customer base.

This seminar will cover an overview of DOCSIS; spectrum, signals and protocols; DOCSIS cable modem self-provisioning; upstream/downstream corrective measures; DOCSIS system design architecture and configuring the cable modem; and cable modem termination systems (CMTSs).

The dates and locations for this seminar are:

- Nov. 9: Hilton Albuquerque, Albuquerque, N.M.
- Nov. 11: Ramada Inn Downtown Phoenix
- Nov. 30: Embassy Suites, Austin, Texas
- Dec. 2: Best Western Sterling Inn and Conference Center, Sterling Heights, Mich.

Cisco System's Jerry Goodrich presents the Data Over Cable Service Interface Specification (DOCSIS) seminar in Indianapolis in July. SCTE plans to hold four more sessions on DOCSIS this fall.

John Downey, a trainer for Wavetek Wandel Goltermann, attended this seminar in July. "I consider SCTE to be the nucleus of the cable telecommunications industry and a good source for the latest information," he said. "By offering this one-day course in my area at a reasonable rate, I was able to attend without losing too much of my own valuable time and still get some exceptional training and nice take-away materials."

To register for the DOCSIS Deployment seminar, call Jessica Dattis in the SCTE National Conferences Department at (800) 542-5040 or e-mail jdattis@scte.org. For more information about the Society's Technical Training Seminar Series, call SCTE Director of Regional Training Ralph Haimowitz at (828) 264-8310, or e-mail rhaimowitz@scte.org. CT

Western Show Tech Sessions

Looking for up-to-date information on some of today's broadband challenges? Be sure to attend the five technical sessions that SCTE is sponsoring at this year's Western Cable Show, Dec. 15-17 at the Los Angeles Convention Center.

The SCTE is sponsoring the following sessions:

"IP Telephony Update" will review the progress of Internet protocol (IP) telephony. Panelists will discuss the positives and negatives of the technology available today and speculate on the future of IP telephony. Moderator is Justin Junkus of KnowledgeLink, with speakers John T. Chapman of Cisco Systems, J.R. Anderson of High Speed Access Corp. and Greg Dubberly of Scientific-Atlanta.

"Regulatory Update" will examine some hot regulatory issues facing the industry. Moderator is Stephen Ross of Ross and Hardies, with speakers John Wong of the Federal Communications Commission and William Check of the National Cable Television Association.

"In-Home Networks" will highlight the technical complexities of, and potential solutions for, dealing with interfaces of new products such as digital video, cable modem and telephony service in the home. Moderator is Alan Babcock of SCTE, with speakers Jack Holloway of Epigram, John J. Downey of Wavetek Wandel Goltermann and Anthony Filanowski of General Instrument.

"How Are We Doing in Reverse?" will focus on some of the new technologies needed to fine-tune the reverse system network. Moderator is Steve Allen of TVC Technology Center.

"DOCSIS 1.x—Where Are We, and Where Are We Going?" will take a look at the changes and improvements that can be expected from the next version of DOCSIS. This panel also will share the views of operators who have deployed cable modems. Moderator is Donna Brune of 3Com Corp.

Certification testing also will be available at the Installer, Service Technician, Broadband Communications Technician/Engineer (BCT/E) and Telephony levels. For more information about these SCTE technical sessions, call SCTE Director of Training Development Alan Babcock at (303) 768-8667 or e-mail ababcock@scte.org.

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Reader Service Number 19

Interview with a Leader

By Rex Porter

SCTE Charter Member Bill Karnes

Bill Karnes

Bill Karnes, currently president and owner of ISC Datacom, numbers among the 79 charter members of the Society of Cable Telecommunications Engineers. However, he already was an industry veteran at the Society's inaugural meeting in 1969, having started in cable in the early '50s. Let's get to know him a little better.

Communications Technology: *Bill, tell us a little about your younger days—before cable.*
Bill Karnes: I was born in a small town south of Dallas, grew up and went to school in Dallas and graduated from Crozier Technical High School. I got interested in radio in about my junior high school days and built crystal radio sets in my early high school days.

In high school, I took a couple of years of radio courses under a teacher named Grey Moore. Mr. Moore was a great teacher, an active ham radio operator who had done a lot of work in high frequencies. Back then, we thought that frequencies above 30 MHz (we said megacycles then) were not of much use, and Mr. Moore was one of the first to try to prove that idea wrong.

After high school, through the Air National Guard, I was able to go on temporary active duty and went through the Air Force Basic Radio School at Scott AFB in Illinois. In that school, I relearned all the AC and DC theory that we had covered in high school, plus learning a lot about military communications equipment. After that, I came back to Dallas and spent about a year and a half learning to run an offset printing press.

In 1950, the Korean conflict erupted. I was still a member of the Air National Guard. Driving home from work one evening, I turned on the car radio just in time to hear the announcer say " ... and those were the Texas Air Guard units that were mobilized for active duty today."

Since you can't punch "rewind" on a car radio, I had to wait another half-hour or so 'til I got home to verify that, yes, indeed, my squadron was one of the units being called to active duty. A week later I was at Hensley Field in Dallas, wearing a khaki uniform again.

We were sent to Langley Field in Virginia so our pilots could transition from F-84 jets to F-86 planes. I applied for and was assigned to go back to school, this time to Advanced Radio School, also at Scott AFB. On graduation, I didn't have enough time remaining on the call-up period for overseas assignment, where my original Guard wing had been sent, so I was sent to a tow-target squadron based at Sewart AFB near Nashville, Tenn.

My job was to take care of the radios in the squadron airplanes. Since the planes were used to pull targets across the sky for anti-aircraft gunners to shoot at, I'm just as glad I wasn't a member of the flight crews.

In 1952, the military decided they didn't need us any longer, so I was returned to National Guard status. I took a job with AT&T Long-Lines division, testing long distance circuits. One day the union called a nationwide strike over issues that I thought were stupid, so I went out and found a job repairing TV sets and installing antennas. When the strike ended, I didn't bother to go back and stayed in TV service for the next two or three years.

One day, I heard about a job with Collins Radio Co. I applied for the job, passed the tests and signed on as a military field service engineer. The main difference in those days between field service engineers and field service technicians was that engineers got leather briefcases, and technicians got vinyl. Also, when we left work each day, technicians had to open their briefcases for inspection by security, but engineers didn't—some government rule.

Our job was to interface with the various military branches and help them use Collins radio gear. Collins lost some contracts with the government, and we had nothing to do but sit around and draw a paycheck, which gets pretty tiring after a month or so.

Communications Technology: *Did you get into cable while working at Collins?*
Bill Karnes: Not because I was working at

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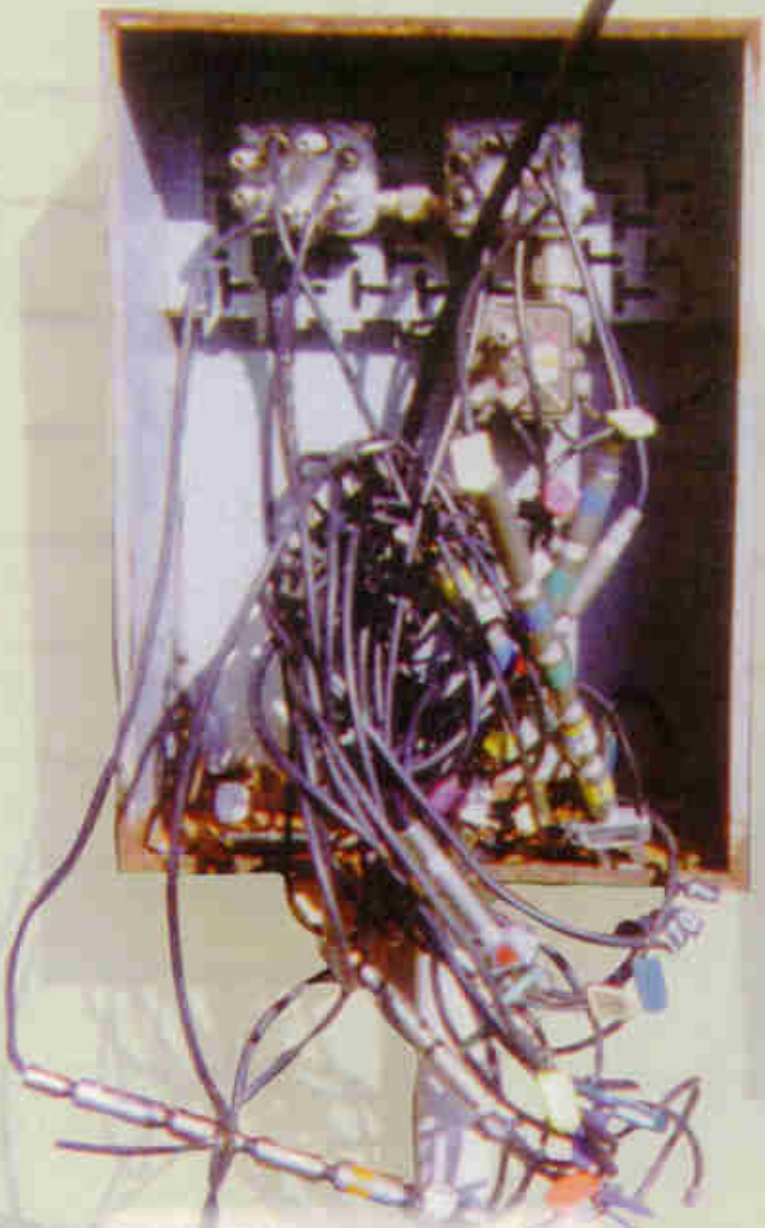

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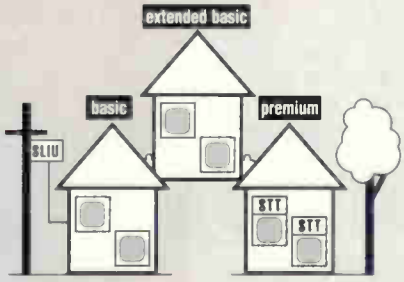

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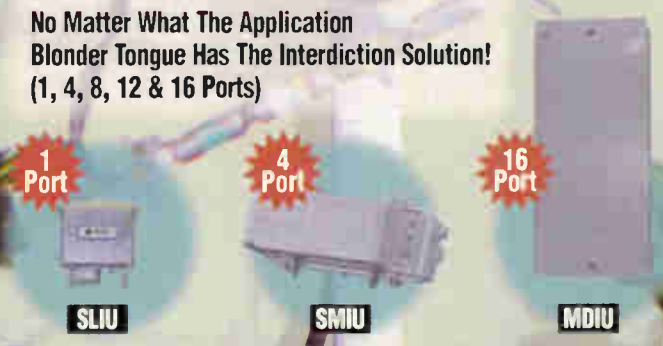

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Reader Service Number 20

Bill Karnes out in the field. Bill started in cable in the early '50s.

Collins, but at the same time. A good friend called me one day and asked me to do him a favor. He said: "I've been talking to this company called Jerrold about a job. They do something called community antenna television (CATV) and are looking for a field engineer. Would you go and talk to them and see if they tell you the same things they are telling me?"

I said, "Sure," and a couple of days later I met Jim Stilwell and Fred Lieberman. Fred was, at the time, national sales manager for Jerrold, and Jim was the Southwest regional manager. I took their test, interviewed, and they offered me the job. So I had to explain why I was there and that I didn't want to interfere with my friend's chances. Fred said, "Well, we're not going to hire him, anyway, but if you're interested, we'd like to have you." I took the job.

Communications Technology: *You seem to have worked with all of the famous old-timers and pioneers of the industry. I remember Bob Magness referring to the engineering work that you did. Tell us about the old days.*

Bill Karnes: I started out as a field engineer for Jerrold, without the slightest idea of what I was supposed to be doing. They had me calling on customers, and one of my first trips was to a place called Memphis, Texas.

In 1957, a young guy named Bob Magness was going to build a cable TV system. Bob had a partner at that time named Dub Bowlus. Both of them had worked for a cattle-feed supplier and had decided to go into this TV venture.

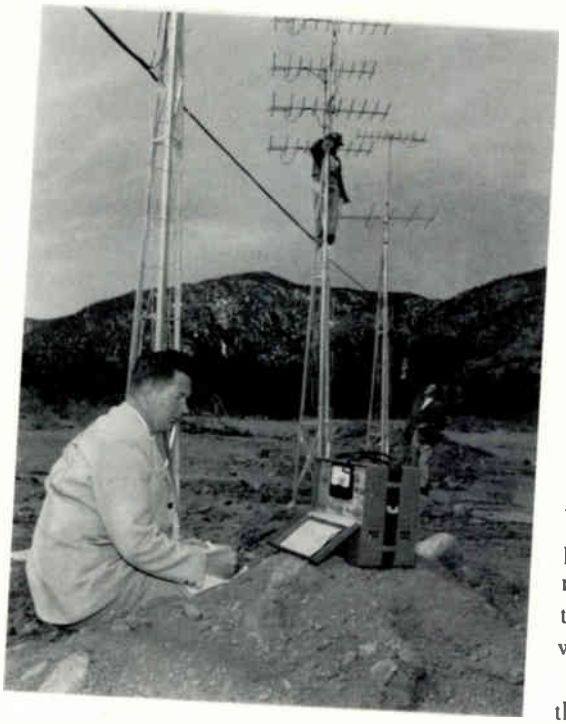
I showed up, accompanied by another Jerrold field engineer named Clarence Light. Clarence gave me a lot of instruction and, by golly, we got that system put together, and it actually worked. All the signals were over-the-air, using a 400-foot tower. Picture quality was nowhere near what we look for today, but it was a lot better than anyone could do with a home antenna.

I remember the night we had the "grand opening" celebration at the National Guard Armory. Bob and Betsy took

orders for service, and we nearly had to hire armed guards for crowd control. I think they signed up 400 or 500 customers that night, which was almost every home in town.

My next job was in Shamrock, Texas, building a system for two brothers, Siebert and Eugene Worley. Both of them have passed on by now. This was my first system to build by myself, and it was also one of the first, if not the very first, turnkey system that Jerrold contracted for. I had another field engineer from Jerrold with me—Dick Obarski.

After Shamrock, I got a new title of sales engineer. This didn't change what I was doing at all, but I suppose it sounded better. My job was to advise customers, design systems and sell Jerrold equipment—not necessarily in that order. I traveled all over the Southwest for the next few years doing that. During that time, I met men such as Jack Crosby, Ben Conroy, Glenn Flynn, John Campbell, George Milner, John Mankin and hosts of others who contributed so much to the growth of the cable business.



Air Force Academy: Karnes and crew set up a cable TV headend during the Academy's construction just outside Colorado Springs, Colo.

Communications Technology: *Didn't Jerrold move you around?*

Bill Karnes: Sure. I moved from Dallas to Amarillo, Texas, and then to Denver. While in Denver, I met a group of investors who wanted to get into the cable TV business. They asked me to come to work with them. The company was called AmericanTenna Corp. We had franchises in Union City, Tenn., and Glasgow, Ky., and we bought an existing system in Wausau, Wis. AmericanTenna was planning to set the world on fire, but never found the right match, so ignition never did occur. Their systems were later sold.

I called Fred Lieberman and told him that I needed a job. Fred hired me as a sales rep, working out of Dallas. A year or so later, I moved to Glenside, Pa., where Fred was headquartered and became vice president of construction for TeleSystems

Corp. We built cable systems in Warner-Robins, Ga.; Selma, Ala.; Lubbock, Texas; Macon, Ga.; and a number of other places. Along about 1967, one of the infamous Federal Communications Commission Report and Order things came along, and new system construction pretty much stopped.

Fred was a partner with Jack Crosby and Ben Conroy in a company called GenCoE, based in Austin, Texas. Since there was no contract construction going on, I moved to Austin and worked with that company for a year or so, during which time we built Midland, Texas. GenCoE was sold to Livingston Oil Co., and the headquarters moved to Tulsa, Okla. I didn't want to go there, so I decided to do some freelance consulting work.

Bill Karnes receives a progress payment check from Frank Lee (now deceased) for cable system construction in Lubbock, Texas.

Communications Technology: *I remember GenCoE—what happened to that outfit?*
Bill Karnes: Livingston Oil operated it under the name LVO Cable, which was bought later by Gene Schneider, and all that eventually became United Video.

After deciding to pass up the move to Tulsa, I did contract work on various projects. I went to a Christmas party at Jack Crosby's house in Austin and met a young man named Doug Jarvis. At the time, Doug was president of National Trans-Video, a cable multiple systems operator (MSO) owned by Charles Sammons. I had met Doug before, but we had not known each other well.

A few weeks later, while working at a headend in Plainview, Texas, I got a phone call from Doug. He had decided to leave the cable business and resign from National Trans-Video. He was recommending his operations vice president, a man named Dick Gamble, as the new president. Doug said that Dick Gamble would need an operations person and asked if I would be interested.

A couple of days later, Dick called me to come to Dallas for an interview, and a few days later he offered me the job of vice president, operations, of National Trans-Video. This was in about September of 1968, and one of my first assignments was to attend a managers meeting in the Bahamas in January—tough duty, but I did it.

I stayed with National Trans-Video until 1972. During this time the company name became Sammons Communications, and I became its president. We also acquired the cable systems owned by Jerrold Electronics, which doubled the size of Sammons from 100,000 customers to more than 200,000. At the time, this was one of the largest cable deals that had been made, and it was a lot of fun getting it done. Communications Technology: *Didn't you do some work for Bob Story in Oklahoma?*

> "It's been a great life, and I envy the people starting out in cable now."

Bill Karnes: I spent a lot of time working with Bennett and Bob Story. At the time, they owned cable systems in Madill and Durant, Okla. I worked with them for several years as a consultant and eventually rebuilt the two systems as a contractor.

The Storys decided to sell their systems and asked me to act as a broker for them, which I did. The systems were sold to a company called Omni Cable Television, which no longer exists.

In the mid-'70s, I got a call from an operator in Houston, asking me to come and work with them in their subscription TV operation. This system was eventually sold, and I got to be a consultant again. A couple of my consulting customers asked me to contract with them to build cable systems, so I bought some trucks, tools, lashing machines and stuff and hired some guys who knew how to spell "cable." We built systems in Oklahoma, Kansas, Michigan and Texas, and then I sold the company to my superintendent, Les Swain.

Working with Omni Cable, I met Fred Dupuy, and after I sold my construction business, Fred asked me to join him in a small venture to design and build a low-cost character generator. At the time, character generators were selling for $7,000 and up, so we did well with our $3,995 unit. It didn't take long, though, for the big guys to discover us, and they started coming out with lower cost products at lower prices, and since we were not financed heavily enough to with-

stand the waiting period, we sold that company.

Along the way, I had met Jack Moore. Jack was running a company designing and building electronic news gathering trucks. That company failed, but Jack found an opportunity to start a subsidiary of a company called TI IN Networks, out of San Antonio. TI IN was in the distance learning business and wanted us to become a subsidiary to provide them with research and development, manufacturing, and field maintenance. We did that, and after a year or so TI IN decided to close its doors, leaving us out on the concrete.

In the meantime, Jack found an opportunity to buy an RF modem product line from Ferranti Aerospace. He asked me if I would like to join him in making the acquisition and building a company, to which I said yes. We were able to make the purchase with no money down and pay for it out of future profits. Since total purchase price was $125,000 and we had more than $200,000 in firm orders on the books at time of purchase, it didn't take long to pay off the note.

Later, we brought in another partner and bought out Jack's interest, and then further along, my wife and I were able to buy our partner's interest. We also acquired another modem product line, and we have developed some new products on our own.

Communications Technology: *Bill, I know that you have been involved in some pretty interesting situations during these many years. Would you share some of these with us?*

Bill Karnes: Well, 43 years of cable TV has been fun, and it's been "interesting."

Back in the late '50s, we were changing the Tyler, Texas, system from a three-channel strip-amp system to a five-channel "broadband" system. Early one morning, Dick Obarski and I were balancing some amplifiers that we had changed out earlier and found that we had forgotten something or other that we needed. Whatever it was, we had left it at the headend, and Dick drove back to the headend to get it.

Let me set the scene up for you: It's early fall; the morning is a little cool and crisp. We've been up since 4:30 or so, and it's now about 7 a.m. At that time, amplifiers were installed in cabinets mounted on cross-arms attached to the poles. Strand-mounting hadn't been invented yet. Our signal level meters (SLMs) were 120 V powered, and we got power from the AC plug strip up in the amplifier cabinet. We also used a long RG-59 jumper to read levels on the ground.

I had the SLM in the front seat of my station wagon, with power and signal cables running out the window and up to the amplifier cabinet. Given the cool morning and with nothing to do until Dick returned, I sat down in the car, started the engine and ran the heater. The windows were rolled up, of course. Having been up for a while and finding myself toasty warm from the car heater, I dozed off.

> "I bought some trucks, tools, lashing machines and stuff and hired some guys who knew how to spell 'cable.'"

Suddenly I heard this bang-bang-bang on the car window. Startled out of my dozing, I opened the door to see a man standing outside asking, "Are you all right?" "Of course," I answered. "Well," he said, "I saw you sitting there with your eyes closed and the engine running and them hoses running up to that electric pole, and I wanted to make sure you were OK."

Then there was the time that Jim Stilwell forced an airline flight that had already departed to come back and get him. Try that in today's market. Anyway, Jim, who was known in the cable business for making flights by the last coat of paint on the clock face, was in Bluefield, W.Va. For a change, he got to the airport about a half-hour before flight time.

The plane had not yet arrived, and since there was precious little to do at the Bluefield terminal, not even coffee, Jim decided to drive down the road and grab a cup. He got back about 10 minutes before

scheduled departure, only to have the desk guy tell him that the flight had already come and gone.

Jim's "You can't do that!" yells were met with: "Yes, we can. If a passenger is not present 10 minutes before scheduled departure, we can leave without him." Jim threatened all kinds of punishment for this, and finally the desk guy said, "I don't have to do this, but since there was no one else on the plane, and since it's on the last leg of its trip for the day, let me call the captain and ask him what he'd like to do."

The captain, who was only a few minutes out anyway, agreed to come back and get Jim. As far as I know, this is the only recorded instance of an airline coming back to get a passenger after the plane's already left. It probably helped that the plane was a DC-3.

Communications Technology: *What about helping to start the SCTE?*

Bill Karnes: There are lots of places where the history of SCTE can be read, and I am really proud to know that my name appears among the others who started this society, nurtured it and helped it grow and become the force that it is today.

The basic philosophy that we began with is still the underlying message—training and interchange of information. To see the membership grow from fewer than 100 people 30 years ago to 15,000 today, and to walk through Expo and see the exhibits, and to realize the seriousness with which the Society is received by other elements of the electronics industry, are all sources of tremendous satisfaction to me. I hope, and I believe, that the other founding members feel the same way.

My last comment is just this: For 43 years, I've never had to work for a living, and I've not met more than a couple of people that I would not want to sit around a table and reminisce with. It's been a great life, and I envy the people starting out in cable now. They are going to look back in some number of years, and although the level of knowledge required now is light years ahead of what we had to learn, I hope every one of them can say, "It's been a great life!" CT

Rex Porter is editor-in-chief of "Communications Technology." He can be reached via e-mail at tvrex@earthlink.net.

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Reader Service Number 25

By Ron Hranac

High-Pass Filters Revisited: Lines Drawn in the Sand

High-pass filters are passive devices that block most or all frequencies below a so-called cutoff frequency and pass most or all frequencies above that same cutoff frequency. They physically resemble the positive and negative traps that we've used for years for premium channel security, cost about the same and, in most cases, are even made by the same manufacturers.

One common use for high-pass filters is to block reverse path noise and interference in the 5-40 MHz band while passing conventional downstream signals above 50 MHz. Installation of a high-pass filter at the tap will keep interference that may be generated in a subscriber's drop or home from entering the cable network's reverse path, while allowing that subscriber to receive the downstream TV channels.

Armed camps

In the past, I've taken a somewhat neutral position on the use of high-pass filters. These things often result in emotional debates.

One camp says to install the filters in the drops of all one-way subscribers and then remove them as the subscribers take two-way services. The theory behind this line of thinking is that the cost of the filters—$4 to $6 each, plus installation—is much lower than replacing or upgrading a lot of old or otherwise imperfect drops at $50 or more each. The other camp says high-pass filters are unnecessary in most cases if the drops were installed correctly in the first place.

The latter scenario works well under the Data Over Cable Service Interface Specification (DOCSIS) retail model. It means a subscriber can purchase a DOSCIS cable modem at the local Circuit City, connect it to the drop and happily surf the Web after a self-installation and automatic provisioning process, all without the need for the cable company to send a technician to remove a filter. After all, a two-way cable modem won't work if a high-pass filter is in the line. The filter will block the modem's upstream signal.

As you can see, both sides of this argument have merit.

> "It would be nice if every system had really good drops, but many don't."

Take a stand

These days, I'm leaning more toward advocating use of high-pass filters. The unfortunate reality is that the condition of the reverse spectrum in the majority of two-way systems that I've had a chance to look at over the last couple years is only so-so. There's still a lot of the attitude that "all I need to do to fire up the reverse path is install some reverse actives and maybe adjust a few amplifiers." Yeah, right, and I've got the deed for the Brooklyn Bridge.

Most reverse "junk" problems I see are drop-related, except for alignment issues, but I'm saving that for a rainy day. I also see a lot of low-level signal leakage. While nearly all systems today are pretty good about meeting the Federal Communications Commission's 20 microvolts per meter (µV/m) signal leakage limit, that's simply not good enough for two-way.

Every leak, no matter how small, is a potential ingress point. My experience suggests that most low-level leakage occurs in the drop portion of the network. This seems to confirm that up to 95 percent of the junk that gets into the reverse path comes from the drop: 25 percent or so between the pole (or pedestal) and the side of the house, and the other 70 percent between the ground block and TV set. Where there's a leak, there's ingress.

Oddly enough ....

Speaking of ingress, allow me to digress for a moment. I've spoken with some folks who think that if a given leak is low-level—that is, below the FCC's 20 µV/m limit—then ingress getting into the system via that same leak also will be low-level. While it's generally true that a minimal amount of overall leakage usually results in a minimal amount of overall ingress, individual leaks are not necessarily balanced from the perspective of "if the signal leaking out is low, then the ingress going the other way also will be low."

For one thing, downstream leakage is measured in the VHF midband, and

reverse path ingress occurs in the 5-40 MHz band. The frequency response of the leak is not going to be flat across the spectrum. As well, the amplitude of the signal inside the cable likely will be much different than the level of an interfering signal outside the cable, even if both are on the same frequency.

So, the typically low drop levels of 0 dBmV to maybe as much as +15 dBmV may indeed produce a low-level leak, but a high level over-the-air signal entering the drop through the same leak may produce a high level of ingress.

Reality check

Anyway, it would be nice if every system had really good drops, but many don't. Another unfortunate reality is that cable operators willingly spend millions to upgrade their networks to state-of-the-art hybrid fiber/coax (HFC) architecture, yet do little or nothing about the drops. Granted, some will spend another 10 percent or so to take care of the drops at the same time, but from what I've seen, most don't.

So where does that leave things? Fire up the reverse, align it, and pull out your hair fighting ingress and noise problems.

An effective fix is high-pass filters. Install them throughout the system, and the reverse path spectrum will look, well, clean. Any junk that's left over most likely will be in the distribution network, and you should be able to sort that out fairly quickly. This is a heck of a lot cheaper than replacing a bunch of bad drops.

Then, as a given subscriber signs up for your new two-way cable modem service, remove the filter from that particular subscriber's drop, and upgrade or replace that drop as necessary. Even better, take the high-pass filter you just removed from the tap port and move it to the side of the house. Put it on the splitter output port that feeds the TV sets, videocassette recorders (VCRs) and FM tuners. The port that feeds the cable modem can be left unfiltered, providing a full two-way path for that portion of the drop only!

I've seen this practice done in a number of systems, and it works. The filters keep drop-related junk out of the reverse. It's possible to have a 5-40 MHz noise floor that looks like something you'd expect only in a lab environment.

But what about retail?

"Doesn't this take a lot of wind out of the DOCSIS retail model?" you ask.

Yes, it does, from the perspective of self-installation and automatic provisioning. But let me ask you this: How many of your subscribers have cable outlets near their personal computers (PCs)? Given that most probably don't, how many subscribers would you trust installing their own outlets? You know, an installation that will be done correctly and not be a source of leakage or ingress.

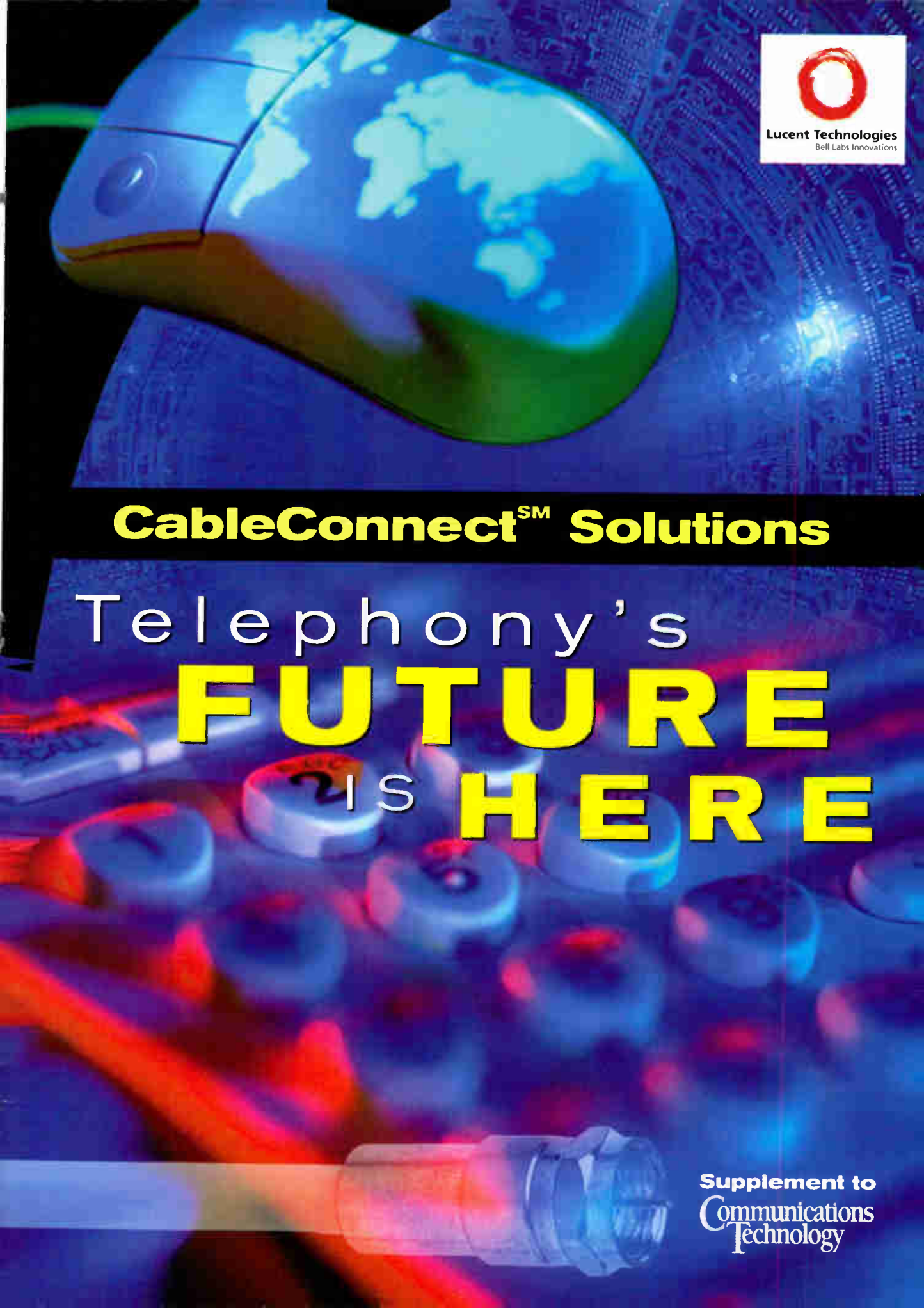
Hmmm, I don't see any hands out there. That tells me it'll still be necessary to send someone to the house to install the outlet, at least until the day when properly installed cable outlets are ubiquitous. While the technician is there installing the add-outlet, the high-pass filter can be moved from the tap to the side of the house and the rest of the drop cleaned up or replaced as necessary.

What about systems with addressable two-way impulse pay-per-view (IPPV) converters? How can high-pass filters be used if the filters are supposed to block reverse signals coming from the homes? Won't they also block the reverse IPPV signals? Yep! To deal with that, our friendly filter manufacturers have available what are called windowed high-pass filters. These are almost the same as regular high-pass filters, except for a narrow bandpass window in the reverse spectrum. In other words, the filter blocks all of the reverse spectrum except for a small part centered on the IPPV converter's upstream carrier frequency.

In all likelihood

If your system happens to be one that's well-designed, built and maintained, is tight, has virtually no reverse ingress, and does all of this without filters, please accept a tip of the ol' hat. But if your system is like most that I've seen, the reverse path can use all the help it can get. High-pass filters are one of the many tools available that will make your job easier and your system's reverse path more manageable. CT

Ron Hranac is vice president of RF engineering for Denver-based High Speed Access Corp. He also is senior technical editor for "Communications Technology." He can be reached via e-mail at rhranac@aol.com.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Editor's Letter

Who Will Provide Telephone Service In The 21st Century?

By Rex Porter

Will customers pay one bill from one network, which provides analog/digital entertainment TV, commercial data, Internet service, and telephony? Better yet, will they make that payment to a cable-TV company, Internet service provider (ISP), satellite provider, or their local phone company?

Cable operators and engineers hope to network all of these services to the home. But telcos are holding strategy meetings daily to decide how to control all communications. Internet providers, such as America Online (AOL), are designing their own "pipes." Satellite providers can't opt to be digital-entertainment-only providers; they will go out of business if they do. Each of these companies wants to own the pipe into customers' homes.

During the 1990s, cable communications companies found themselves facing a narrow time frame in which to introduce high-speed data service and digital-TV. And, just as they were rebuilding their fiber networks for these two services, Internet protocol (IP) telephony was developed.

So far, only cable companies offer the three services on their existing architecture. But that lead will not continue unless we begin to act differently than in the past. We need to start looking to other research and development laboratories if we are to continue to lead the communications race.

Future IP telephony will require a mixture of architectures which incorporate the best of hybrid-fiber coax (HFC) networks and architectures that the voice industry have relied upon for the past decades. While we have learned digital TV and high-speed data services were not as complicated as originally thought, the technology of voice over cable, via IP, is complicated. Incorporating telephony into our cable systems will transform us from a community business to a national (and probably international) business.

No longer can we isolate our challenges from vendors who have provided telephone solutions; we must cooperate better with those who also supply solutions to telephone, ISPs and satellite companies.

We are in the "communications" business. The R&D laboratories of Lucent and Bell Labs are developing solutions for IP telephony. They do not care whether their solutions are used by cable, telcos, ISPs or satellite companies. They are just providing solutions for problems!

I have heard cable engineers remark that we should depend upon our "traditional" suppliers to provide all of our solutions. But IP telephony is not a technology that can be incorporated into our network as easily as data or digital television. We now face the challenge of providing 24-hour telephony, even when electrical power fails. We must provide for emergencies, such as 911 service. Powering will be important, and the vendors who understand such challenges are those who developed telephone solutions throughout the 1900s.

Perhaps we need to review a list of products invented by Lucent/Bell Labs—products we used to build and improve our basic cable systems from the start. Coaxial cable was born in Bell Labs. Engineers at Bell Labs invented optical fiber. Transistors, used in our amplifiers, are its invention. The chip is its brainchild. Its lasers allowed us to profit from fiber optics. Multiplexing was introduced from its labs.

As you read these supplements, you will discover new and innovative IP solutions for the cable industry. Lucent has been our partner, all along. It has provided ideas, products and services for anyone interested in successful communications.

So, who will provide telephone service in the 21st century? Companies, which recognize we are in the "communications" industry, and reach out for the "best" equipment for each service they wish to provide. •

Supplement to Communications Technology

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Interview With A Leader

IP Telephony: It Delivers More Than Voice

By Justin J. Junkus

Operators and vendors agree that IP telephony means more to the cable industry than just telephone service. In the interview that follows, Mark Coblitz, vice-president of strategic planning for Comcast, shares his view of the technology.

***J. Junkus:* Why is IP telephony important to the cable telecommunications industry?**

M. Coblitz: IP is significantly more than telephony. IP is a platform for a large number of services. Everything on the Internet is focussed on IP. It makes sense to be on that platform.

***J. Junkus:* Quality of service and line features are key issues for IP telephony. How are the operators preparing their systems and engineers to meet some of those challenges?**

M. Coblitz: Quality of service in a narrow sense means we will generate IP packets that will get through the system in the timeframe they need to, and we will not drop packets. Because we're operating on a shared system, we want to make sure someone else—like a Web surfer—doesn't get in the way of the IP telephony packets.

We are using DOCSIS for the transport. We, therefore, have a standardized platform for building additional products. DOCSIS 1.1 has quality of service provisions that allow compliant modems to operate with multiple service IDs that have different characteristics. A cable modem in the home can, therefore, be supporting IP telephony calls, Web surfing, and other things. The telephony has priority in the system.

Power requirements are very important to maintaining quality of service. Vendors have shown us paths for getting the power requirements for DOCSIS 1.1 down, but we aren't going to see this in actual products until mid-2000. So, mass deployment probably won't be practical until the second half of 2000.

As far as line features are concerned, most people take a limited set of the features, and that's what IP telephony will deliver initially. Over time, features will be back filled. If you decide that delivering the features that people buy is what is appropriate, then the system can be run totally IP from the time of deployment in late 2000. If you want to deploy every feature of a circuit switched system, then you have to place a Class 5 circuit switch in the system. Our perspective at Comcast is that we are looking to go fully IP, but if you already own Class 5 switches, there's a way to continue to utilize them in the IP space.

***J. Junkus:* How do you project IP telephony to grow as a service?**

M. Coblitz: Cable will be selling telephony, not IP telephony. It's a question of what platform to use to deliver telephony service in the timeframe you want. If you have to enter the market sooner, then you have to go with circuit switched technology. If you can launch later, you have the option of IP. Because of that, cable telephony cannot be a national explosion. There is a massive amount of consolidation and clustering in the industry. What you will see is a launch by market. And then we'll grow the business as fast as possible, wherever we can.

***J. Junkus:* What is the role of cable in offering business telephony systems?**

M. Coblitz: We have several fiber interconnected networks, and companies are entering the business market, both as CLECs for transport, and on the data side. Another facet to business telephony is work at home and telecommuting. Comcast has been working with AT&T since before it bought TCI, and we have a growing number of subscribers employed by AT&T who are telecommuting. We have some large players in financial services that use our work-at-home product. We also are working on IP connectivity and PBX extensions as additional products—PBX access from your home.

***J. Junkus:* Five years from now, what will the cable telecommunications industry be offering its customers?**

M. Coblitz: In our core business, there will be digital video, but also other services, like video on demand. There will be new services that are part of the video world, like e-mail and Web access.

Some services will be part of the IP platform, such as data and telephony. As we start mixing platforms, we are looking at interactive applications that can show up on the set-top and on the Web.

The newest platform will be home networking. There will be a suite of applications, starting with video. We will have E-commerce, where consumers buy from their television. We will see services delivered both by the Web and by devices throughout the home. Access will be by cable modem or the telephone, with an embedded cable modem.

You will see consumers buying more of something they already have. If we use IP for telephony, we will tell our customers that we can connect them to the Web because they have already bought that technology for telephone service.

Our game is about putting platforms in place, and having consumers use those platforms by buying things they already know. •

New Paths To Telephony's Gold

By Justin J. Junkus

You've built your two-way system, and may even be marketing high-speed data or digital TV. Now, you're ready to add another service to your offerings. Telephony is a natural answer. The market is ready for new service providers. However, it's a competitive business with evolving standards, and you need to be a player in tomorrow's markets, as well as today's.

The voice market is extremely attractive. Forrester Research predicts that cable telephony subscriber revenues will reach nearly $12 billion by 2005. While basic cable offerings generate only about $34 per month, local, long distance, and premium phone services average $50 per month per subscriber.

And that's just the beginning—telephony customers typically buy extra services that enhance the value of their phone. Perhaps one of the best examples is caller identification, where subscribers first paid to know who was calling, and then paid again for the ability to block that information about themselves from going to other subscribers.

Satisfying The Customer

Building a system that has the ability to evolve in many different directions has always been the answer to reaching telephony revenue today, and growing it tomorrow. Whatever your starting point, you need to begin with a solution that provides the same "look and feel" to your new customers as they get today. That means giving them a solution where they keep their existing telephones. You need to offer a service that includes virtually continuous operation, despite commercial power outages. You also need to let them keep the features to which they have become accustomed—such as caller identification, call waiting, and call forwarding.

It makes sense to you as a business person to be able to deliver this type of offering. Re-use of existing station sets means that you can concentrate on marketing services, rather than equipment, to customers. They already know how to use the phone, and you don't need to find a supplier who can market, inventory, and service new telephone sets. Providing telephony packages with more value than the incumbent phone company's offering makes it easier to attract customers who know that you already deliver quality video entertainment and high-speed access to the Internet.

Neither this basic marketing strategy nor its revenue potential are news to cable operators. Since the industry became "telecommunications" rather than just "television," you have understood that winning the subscriber's telephony business means providing a better alternative that didn't cause the subscriber any changes except better prices and more convenience.

The problem has been that cable's own infrastructure was often not ready to accommodate telephony's technical requirements. Two-way capability is the most obvious first need, which you are well along the way to solving. But there are also the requirements to include telephony's special signaling protocols that complete voice calls, provide the features that subscribers expect, and support them with back office services.

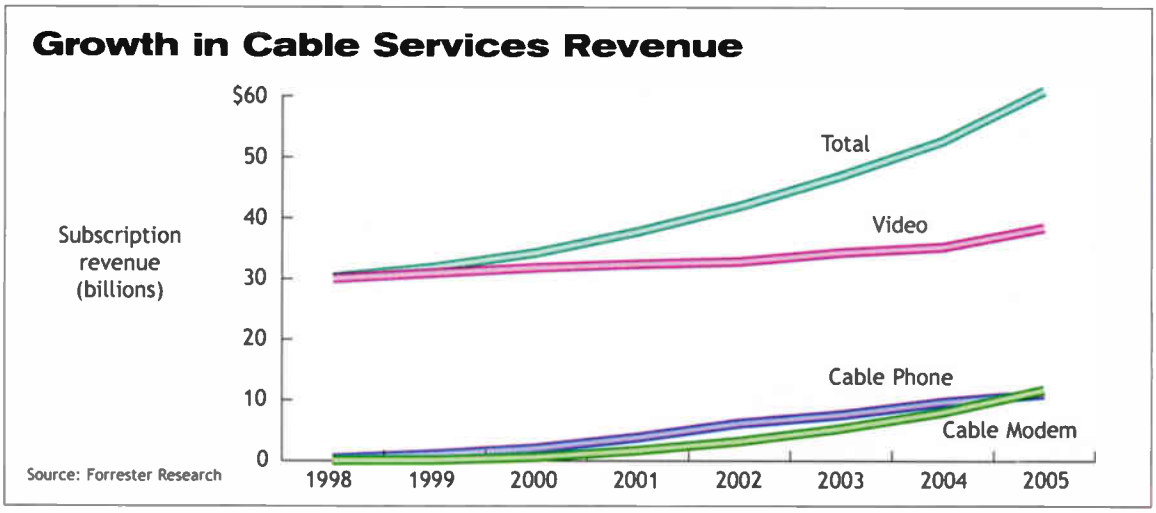
Telephony Pioneers

Despite the challenges and advice to stick to core business, cable's entrepreneurial operators never abandoned the market because the revenue opportunities are so high. Rather, they chose creative ways to gain customers. Some, like Adelphia, leveraged investments in networks to provide long distance telephony, leaving access and feature technology issues to be solved by other business partners. Others, like Time Warner, expanded their trunking networks, bought switches, and served business, rather than residential, telephony needs.

Early entrants to the residential telephony market began with circuit-switched solutions. These architectures offer a way to bring cable telephony service to residential customers over cable's distribution network. They use configurations of network interface units and host digital terminals that connect over standard interfaces to a digital telephony switch. Although this architecture provides both quality voice and high-speed data, it only begins to share equipment between services. The cash flow from circuit-switched telephony has exceeded most expectations, but in the long run, the architecture has limitations that make it difficult to add new capabilities requiring simultaneous voice and data features.

IP Telephony: An Efficient Solution

Achieving the full broadband potential of cable's networks to distribute not only video and voice, but also high-speed data and future services over a single network requires combinations of technologies that are only recently becoming cost-effective. The reason it has been a challenge to develop this technology for telephony is that voice service and its features are so tightly rooted in time-division multiplexing (TDM) technology. The heart and brains of TDM is the time division multiplexed digital switch, with embedded software that defines how connections are made and how features work.



TDM creates and locks up an end-to-end path across the Public Switched Telephone Network. Although the technology is extremely reliable, the circuit-switched network it depends upon is inefficient for today's mix of voice and high-speed data.

This is because data moves most efficiently across networks in spurts of information called packets. Any given exchange of information may include several separate packets. New telecommunications switches based on variable bit rate technology set up these paths as required. There is, however, a penalty to sending information in pieces across a network. Without a dedicated path, the information needs to be managed so that it can be assembled in the same order that it left.

Digital technology allows both data *and* voice to move as packets across networks. While the reassembly of data from packets allows for delays in transmission and the re-creation of lost data, voice is much more sensitive to any changes. In addition, any features associated with a connection must be linked to the endpoints of the connection and the packets that move between them.

That's the difference between voice over IP and IP telephony. Providing network quality telephony service requires a platform that does more than move packets. The good news is that IP platforms are available today, and they are beginning to cost less per line than a circuit-switched architecture. Lucent Technologies estimates that IP telephony is trending toward $500 per subscriber line, which compares favorably to the $700 per line figure for a circuit-switched solution quoted by Cox Communications in its June 1999 presentation at Cable '99.

The Doorway to Information Services

The costs of IP telephony are decreasing as network switch vendors develop unified product solutions. These solutions are platforms that address the general problems of managing packet flow and providing features in a packet-switched environment. The keys to them are architectures borrowed from the data industry, called client-server networks. Telephony and data functions are distributed in these architectures to separate processor-based elements, which are called into service for both voice and data functions as needed. Because the elements are distributed, software that defines network routing, features, or user privileges can be more easily changed without the need to completely change the network. Such a flexible approach also enables cable operators to create new telephony service packages targeted to specific markets.

These new networks are the future of not only telephony, but all multimedia communications. Implementation in cable or in any telecommunications network will not be without challenges. Maintaining voice quality requires that servers be able to mark and monitor voice packets not only within a cable system, but also across connecting networks. Billing for connections and authorizing use of features requires communication with other data systems, typically called "back office" because they didn't need to be part of real-time processing of communications information.

The challenges are formidable, but not insurmountable. Many of the quality problems can be solved with either interconnection agreements or system integration. Interconnection agreements will give cable systems access to networks that keep the quality of service of voice packets intact. Although negotiation is never easy, cable operators have completed similar agreements for current telephony and data offerings.

System integration may require the help of an outside consultant, but it's not a task unique to telephony, or even IP telephony systems. Digital video and data both require tying the back office to real-time transactions, so any cable operator serious about remaining in business probably has already begun this task. Many systems based on circuit-switched technology have already figured out the back office solutions for voice services. With an IP telephony platform, those solutions can be extended to integrated information services.

One thing is certain. Telephony revenues are real. Even early implementations of telephony, if planned and executed with the objective of making subscriber change as easy as possible, have realized cash flows beyond expectation. This attractive market breeds competition, which is sure to lower subscriber prices. IP telephony, with its promise of lower costs and the ability to add services, can bring the long-term winning combination to operators who want to continue reaping the rewards from subscriber demand. •

Lucent Delivers Cable's IP Telephony Solutions

IP telephony is literally the land of opportunity for cable. Cable's traditional customers provide one path for growth, with the convergence of personal voice, video, and data at the single family residence. Small business and work at home are another opportunity, and so is communications for the multidwelling unit. New markets are quickly developing with large business users.

IP telephony is not just a less expensive way for your customers to make a telephone call. It's a technology that opens the door for any form of information your customers need, at any step of their call. Information like fax, web pages, e-mail, and voice messaging can be delivered, in addition to regular voice telephony features. IP telephony offers the ability to forget distance and interact with other subscribers on the network, in real time. It also enables the ability to be more productive, or to play games with friends thousands of miles away.

Building the networks to serve these opportunities is a big job, and Lucent Technologies can make that job easier for you. Our experience with traditional telephony and data networks, coupled with our technology contributions to the cable industry, provide your one-stop entry to new opportunities. Lucent digital switches built the Public Switched Telephone Network. Fiber optic technology invented at Bell Laboratories grew cable's bandwidth. Now, the cable telecommunications industry can use that expertise and the next generation of Lucent products to change the landscape of telecommunications in the 21st century.

CableConnect℠ Solutions

Transform Your Company From A One-Way Street Into A Two-Way Communications Autobahn

Lucent's CableConnect℠ Solutions is a set of integrated products and services that will enable you to offer customers full-featured, highly reliable telephony service, high-speed data access and digital video—all from your existing cable network.

As a true end-to-end solution, CableConnect includes all these elements needed to upgrade your network, from hardware to software, from the headend to the end user. CableConnect also delivers unsurpassed integration and technical support for rapid implementation and worry-free system management. We'll get you to market fast, so you can quickly begin maximizing the return on your investment by offering complete, customized, two-way communication from a single connection!

Begin Your IP Telephony Offering With NetCare

Lucent NetCare is a suite of services that makes it easy to launch, grow, and maintain new IP-based offerings. Backed by Bell Laboratories technology and expertise, Lucent NetCare has the largest direct, skilled global services force in the world, with more than 25,000 engineers, installers, and technicians. Cable operators can draw on these Lucent NetCare resources to define, design and manage a network that is the platform for IP telephony and new services that follow.

Lucent Netcare is already helping companies make the transition from traditional video products to telecommunications services. In Spain, it took only seven months for a Lucent team to transform Retevision from a TV distribution company to a telecommunications company with over one million subscribers. There, the NetCare team helped coordinate building the network and getting it running. It now mentors Retevision personnel as they prepare to take over full operations and maintenance.

NetCare service is available in four categories:

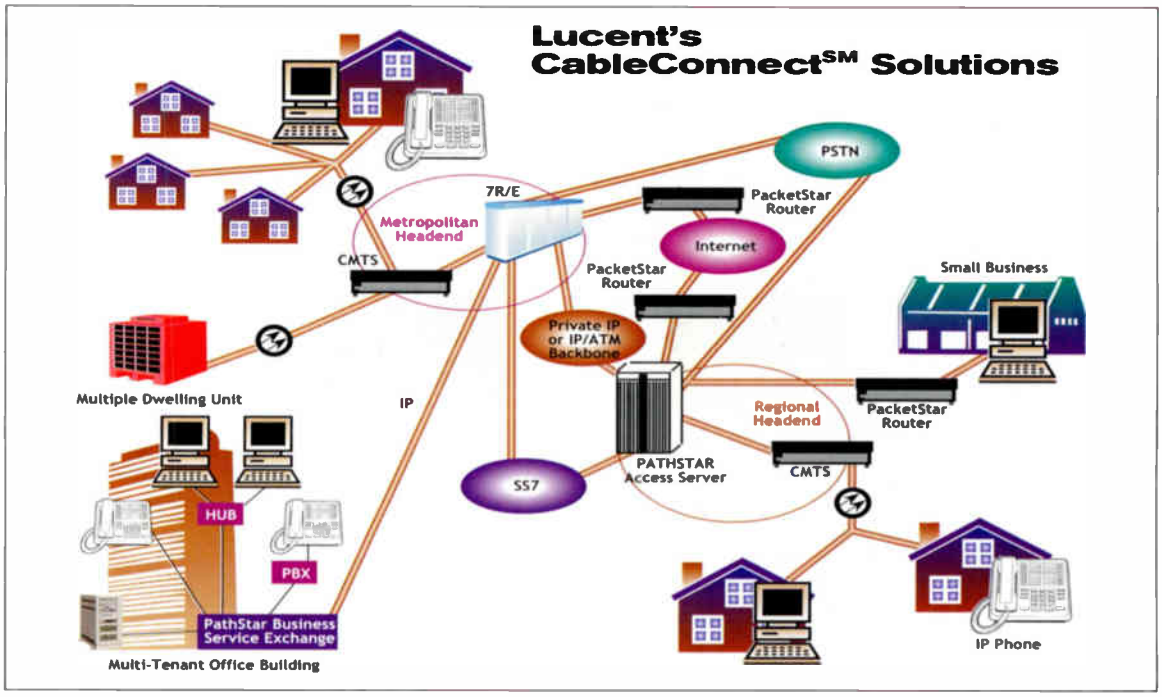
- Planning, which includes business planning consulting, services marketing, network planning and design, network operations planning, customer care consulting, security, and multimedia solutions customization.
- Implementation and Integration, which includes site selection and construction services, staging, engineering, installation, and integration of systems into multivendor and multitechnology environments.
- Operations and Administration, which includes network management services like fault management, configuration management, and performance management, as well as service provisioning, network operations services, and customer care.
- Support and Maintenance, which includes remote and on-site support and maintenance, education, and training.

Hardware and Software Designed for Your Market

At Lucent, we know that each cable operator has different objectives and timing for delivery of new services. The products and services in our CableConnect Solutions are designed to create customized IP telephony platforms for your present and future customer offerings. They are built upon technology that delivers core video and high-speed data capability, as well as IP telephony. Because they come from Lucent Technologies, they are guaranteed to work together to turn your market opportunity into a market reality.

From the same system, you can offer telephony service to residential subscribers, business users connected through a PBX, and users with IP-phone clients, such as multimedia PCs, IP phones, or IP-based integrated access devices. You can also offer dedicated IP-data access at NxDSO, DS1, DS3, or OC3 rates.

As you grow, CableConnect Solutions can grow with you. The design philosophy behind the products in CableConnect Solutions gives you the option of starting



at a point that fits your business plans, and seamlessly expanding your offerings and markets when it makes sense to you.

PathStar™ Access Server For Emerging Markets

The PathStar Access Server is targeted to cable networks in small to medium line-size areas serving primarily residential and small- to mid-size businesses. PathStar is a carrier class, packet end-office solution that consolidates the functions of multiple network elements—voice over IP gateway, telephony system, remote access server, edge router, and others—into one space-saving integrated system. Capital and operations costs are reduced over nonintegrated solutions.

An IP telephony solution that includes a PathStar Access Server delivers popular telephony features to your customer, as well as network quality telephony service. You have the capability to offer your customers the most important features, such as 911, call waiting and caller ID, over a cable network. The features that PathStar delivers free you to market service packages that exceed your subscriber's current telephony service.

The 7R/E™ Packet Solution For Large Markets

The 7R/E is targeted to cable networks in large metropolitan areas serving vast numbers of business and residential customers.

The 7R/E processes calls in packets over IP networks and delivers more than 3,000 services and features with the same voice quality as traditional telephone networks. It allows you to go beyond offering basic local residential service features to packages such as long distance and business Centrex services. You can even offer advanced data services such as Internet firewalls, click-to-dial, and Internet call waiting.

The 7R/E also includes an open, programmable feature server to enable rapid delivery of new features. An open application programming interface allows you to develop new features and add them to your network whenever and wherever you see a new service opportunity.

IP Packet Traffic Management Solutions

When calls leave your managed network, Lucent PacketStar products give you the capability to maintain end-to-end quality of service. Products in the PacketStar portfolio deliver service agreements across networks, as well as within them.

Cable Modem Systems

Lucent's cable offer includes two products from Motorola. At the headend, the cable operator's network can take advantage of the Cable Router Cable Modem Termination System (CMTS), which terminates cable modem traffic and sends it to the PathStar or 7R/E for telephony processing or routing over the backbone packet network. In a subscriber's home or office, the PhoneLink Multimedia Terminal Adapter (MTA) connects to PCs and regular telephones, and provides "always on" access to IP telephony and other cable modem services.

Billing, Customer Care And Order Management Software

Lucent solutions built on Kenan Systems' Arbor/Broadband products support everything from service ordering and integration with field operations to billing, payment processing, and customer analysis. As cable operators move to providing multiple service packages, Arbor/Broadband helps them by offering innovative service packages, discounts, and pricing plans with superior customer service.

The Options Are Yours— The Solutions Come From Lucent

Cable's entrepreneurial style is one of the reasons for its success. Lucent has designed its IP telephony CableConnect Solutions to fit into the business and technology plans that make sense to *your* company. Call us at **1-877-534-9182** or visit **www.lucent.com/cableconnect** to learn more about how Lucent can be your resource for delivering the next millennium's telecommunications services. •

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New feature attraction on cable (from leader in rapid service deployment). Lucent delivers all the feature-richness of the voice network over cable (with all its reliability). Lucent's CableConnect℠ solution lets you offer call waiting, call forwarding, operator assistance, directory services, high-speed data services, more. Even itemized billing. Think coaxial nirvana (thank our R&D brains at Bell Labs). Call 1-877-534-9182 or visit us at www.lucent.com/cableconnect for the latest cable news.

We make the things that make communications work.™

Return Path Maintenance
(You Can't Beat The System)

GUARDIAN™ SYSTEM

Only Trilithic offers a Return Path Maintenance System.
The Guardian System goes from the subscriber, to the pole, to the headend for complete ingress detection, diagnosis and resolution.

The RSVP™. Just connect the GUARDIAN RSVP in place of the subscriber's two way terminal and press the "TEST" button. The RSVP communicates with a 9580-SST reverse path analyzer located in the headend, tests the return path, and gives the installer a simple "PASS" or "FAIL" message and measurement data.

The 9580-SSR™. Up to six SSR field units can communicate with one SST simultaneously. The SSR displays ingress and reverse sweep information. The 9580 and GUARDIAN products are a complete return path maintenance system designed to test and service the entire return path.

The IsoMeter™. Now there is a fast and easy way to test the home cabling for resistance to signal ingress. The RSVP generates a special 28 MHz test signal. The installer uses the IsoMeter to track down leaks in the cabling. Moving in the direction of the leak causes a rise in pitch, quickly pinpointing its location.

The 9580-TPX™. The 9580-TPX offers a very attractive alternative for monitoring a large number of return test points for ingress at a relatively low cost. The TPX is fully compatible with the 9580-SST, expanding capacity up to 64 test points.

The 9580-SST™. The SST headend unit collects balancing and ingress measurement data from one to eight test points, and transmits updated measurements to the SSR field units, the second component of the 9580 system. The SST operates as an ingress monitor, receiving 80 ingress samples per test point, per second.

Ingress Management Software. Allows the operator to set up a powerful ingress monitoring system for hundreds of reverse path test points. IngressManagR™ compares the ingress spectra measured at each test point to its own user-settable limits, logs data, sounds alarms, calls pagers and initiates other programmed responses if the ingress exceeds those limits.

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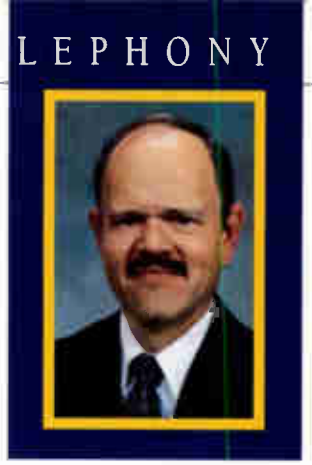
By Justin J. Junkus



Home Networking: It's Closer Than You Think

You've just bought your second personal computer (PC), and your 10-year-old is going to "inherit" the old system. Now, you have to get your second printer and decide when each of you will use the Internet. Or maybe not.

Where there are two computers, there is potential for a network to hook them together so that both machines can share files. The network also can be used to share other resources, such as printers, scanners, disk drives and even cable modems. This column won't get into the software and configuration of the computers, however. We're going to concentrate on the things you can see as soon as you open the door to the family "computer room."

Networking 101

There are lots of ways to build a network of computers suitable for home use. In the distant past (about a year ago), the only way to do it was to build a small version of a business local area network (LAN).

The most apparent sign of a networked house used to be the maze of wires running between the devices on the network. Because the home computer user was mimicking a corporate network, he or she had to string network-grade media between the devices on the network. If everything is in the same room, this is not a big problem. However, many two-computer folks want to keep the machines in separate rooms.

Here's where telephony comes into the picture. Your home already comes equipped with wires between most of the rooms, courtesy of the contractor who installed phone and electrical service. Obviously, you can't just plug an Ethernet into the phone or electric lines. The signals that are already on those lines would wreak havoc on a computer system. (Picture 110 VAC on the transmit and receive leads of a modem!)

> "The most apparent sign of a networked house used to be the maze of wires running between the devices on the network."

You can get there from here

With a network interface that provides filtering and operates at frequencies outside the range of the signals usually found on the media, however, those media can be shared. Here you have two choices: the electric lines or the phone lines.

To date, most commercial development is focused on using phone lines as the networking media. A growing group of vendors including Intel, Lucent Technologies, Compaq, and Tut Systems has formed the Home Phoneline Networking Alliance (HomePNA). Together, they have established a de facto standard that builds upon the Institute of Electrical and Electronics Engineers' 802.3 (Ethernet) protocol to specify physical and logical interfaces between networked devices and phone wire used as a network medium.

Today's potential in-home networkers can buy a kit for less than $200 that typically consists of two or more network interfaces that plug into a phone outlet, connecting cords and software for the PCs being networked. The network interfaces also must be connected to the computer's parallel port and to a nearby electrical outlet for power.

PC cards also are available as network interfaces if the parallel port is being used for another application, such as a Zip Drive. Software installation is relatively simple with the Install Wizard that is part of the kit.

How it works

Home phoneline uses frequency division multiplexing (FDM) to assign each communications service on the media to a frequency spectrum that is different from all others. The in-home network operates between 5.5 MHz and 9.5 MHz. Passband filters in the network interfaces block both standard voice communications signals in the 20-Hz to 3.4-kHz range and universal asynchronous digital subscriber line (UADSL) signals in the 25-kHz to 1.1-MHz range.

The HomePNA literature states that network throughput at 1 Mbps is possible today. Off-the-shelf products are available from both Intel and Compaq. The technology for 10 Mbps is part of HomePNA's

2.0 standard. Near-100 Mbps capability is promised with future developments.

The core technology for HomePNA was developed by Tut Systems and is called Time Modulation Line Coding Method. In essence, it is multibit modulation with adaptive circuitry that adjusts for varying noise on the line. Within each adapter, both receiver and transmitter continually monitor line conditions. The receiver circuit adjusts for noise levels, and the transmitter varies its output signal strength.

What installers must know

There are two areas I suggest cable installers understand when they interface a HomePNA network to a cable system: what exactly it means to share a high-speed data connection to the cable network, and what might need to be done to avoid interference between circuit-switched cable telephony return frequencies and frequencies used by the HomePNA.

Typically, the software included with networking kits sets up the networked computers for shared Internet access. One of the computers on the network must contain the network interface card (NIC) that connects to the cable modem, and the others communicate with the Internet through the network.

While access sharing is thus part of the network, simultaneous access is another scenario. To control network load, the cable operator or the Internet service provider (ISP) may constrain access to one device at a time.

Some services, such as AOL, allow simultaneous access to the Internet, but restrict users on the same account to one-at-a-time access to AOL-specific services. A cable installer who hooks up high-speed data as a replacement for dialup service will need to understand the company's policy for simultaneous Internet access.

As far as connecting a HomePNA system to a circuit-switched hybrid fiber/coax (HFC) telephony system, the degree to which the HomePNA's signals are isolated from the cable telephony system will depend on the vendor of the telephony system. While HomePNA blocks telephony frequencies from the data network, the reverse is not true. The sampling rate used in typical cable telephony analog-to-digital (A/D) conversion will not "see" HomePNA frequencies on the telephone line.

However, there could be some RF interference between input and output of the telephony network interface unit (NIU). (This is the box on the outside of the house, not the adapter that plugs into the phone outlet.) If excessive return frequency hopping becomes a problem when you hook up to a home with a HomePNA network, it might be worth installing a filter that blocks the HomePNA frequencies between the NIU and the rest of the subscriber's wiring.

Phone wire alternatives

In some cases, a homeowner may elect to dedicate some of the telephone wiring in his residence to the data network, rather than share it with regular phone service.

In this case, the home network can be a true Ethernet, operating independently of the phone system, except for dialup data access. With this arrangement, the cable installer needs to know that the subscriber may need to use a router to interface cable's high-speed data service to the in-home network. In general, network interfaces do not allow connection to two Ethernet networks at the same time.

For more information

In-home networks are generating a lot of interest in the cable industry. CableLabs has established a working group similar to PacketCable to look at the standards and interfaces to cable systems. The Society of Cable Telecommunications Engineers is discussing the topic in an issue of *Digi-Points*, which can be accessed at its Web site, www.scte.org. In addition, the SCTE Emerging Technologies conference in Anaheim in January will include papers on the future of this interesting technology. CT

Justin Junkus is president of KnowledgeLink, a consulting and training firm specializing in the cable telecommunications industry. To discuss this topic further, or to find out more about KnowledgeLink, you may e-mail him at jjunkus@aol.com.

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Reader Service Number 31

By Jennifer Whalen

Road Runner Makes Cable Modem Installs Easier

If the cable industry ever hopes to reach penetration levels for its broadband data service equal to that of America Online's roughly 18 million subscribers, it will have to conquer the provisioning obstacle. Road Runner thinks it has solved this thorny problem.

The cable Internet service provider (ISP), headquartered in Herndon, Va., revealed that it has developed an online self-registration and service activation system that it intends to launch in MediaOne's Minneapolis market this month. By speeding up installation, Road Runner thinks it will drive its cable modem penetration from hundreds of thousands of users to millions of users. The system will roll out to other MediaOne and Time Warner affiliates throughout 2000.

Installation woes

"Up until this point, cable modem installation has been very labor intensive," said Ron Dobes, vice president of provisioning and systems engineering for Road Runner.

Customer service representatives spend considerable phone time determining if service is available in a customer's location, discovering whether the customer's computer meets the minimum requirements for service and scheduling an installation appointment. Frequently, two installers visit a customer—an RF technician to perform the cable modifications, and a personal computer (PC) technician to configure the computer and modem. "This is not a model for moving forward for millions of users," Dobes said.

Through a series of Web-based prompts, the new system allows the prequalification efforts to occur online, without intervention of an agent. An RF installer still visits the residence to modify the cable plant, but the modem and PC configuration, as well as the service activation and billing system integration, now occur online. So, installs that had taken two technicians two hours to complete now will take 30 minutes. Customers also can make changes and additions to their existing service via the online system.

> "By speeding up installation, Road Runner thinks it will drive cable modem penetration from hundreds of thousands of users to millions of users."

Objective: Growth

"Our objective is for service activation to be no more complicated than AOL," said Carl Rossetti, Road Runner's chief executive officer. Road Runner currently is adding about 10,000 new customers each week. "We can easily see this moving us to 50,000 new customers a week in less than a year," Rossetti added. The cable ISP exceeded 420,000 subscribers at the end of the third quarter.

The automated systems also will help alleviate the backlog of customers who have ordered service, but have yet to be turned up. "We have one month's worth of backlog at any one time," Rossetti said. "This opens the sales gate. Right now (cable operators) are managing sales against the installation capacity. This ratchets up the installation capacity."

Any development that pushes more bandwidth onto Internet backbones is good news for vendors in the broadband industry. With more customers expected to buy the service as provisioning gets easier, network capacity requirements are sure to increase. Currently, Road Runner's backbone carries roughly 10 GB of traffic per week, with the average user generating 4-5 kB of traffic a week. Low-speed dial-up subscribers, however, consume only 1 kB of traffic a week, reports Road Runner.

Why now?

Why is the time suddenly right for automated provisioning? The stellar success this year of CableLabs' modem certification efforts is the biggest driver. Currently, 11 cable modem vendors have passed CableLabs' interoperability tests, which certify that the modems comply with the Data Over Cable Service Interface Specification (DOCSIS). Each month, additional modems receive certification. DOCSIS-compliant modems already are hitting retail shelves, and more will follow as manufacturers and retailers gear up for the Christmas selling season.

"This is an example of the value of DOCSIS," Dobes said. "It allows us to develop one technical solution to provision the modems from all vendors." ➤

Road Runner estimates that 42 percent of its affiliated systems currently are DOCSIS-compliant. The industry as a whole will be aggressively moving to DOCSIS systems in 2000.

Another key factor supporting self-activation is the fact that many new PCs, such as those offered by Road Runner partner Compaq, come with Ethernet network interface cards (NICs) preinstalled. This eliminates the need for the technician to crack open the PC to install the NIC.

A little help from our friends

Road Runner didn't develop and engineer its auto-provisioning system on its own. Multiflow Technologies developed the prequalification technology used in the system, and Cisco Systems developed the provisioning middleware—dubbed the Subscriber Registration Center—used for service activation.

Cisco has big plans for its Subscriber Registration Center middleware and views it as a foundation for a multimedia future that includes a complex mix of data, voice and video services, reported Paul Bosco, Cisco's vice president and general manager of cable products and solutions. The company has a five-phase plan for adding more functionality to the middleware so that it can be used with the next generation of set-tops, game players and other emerging thin-client devices for the home to provision voice over Internet protocol (VoIP) and video-on-demand (VOD) services.

In its current phase, cable operators also can use the middleware to offer multiple tiers of high-speed data service. Currently, cable modem services run about $49.95 a month. "We may decide to offer an entry level price where we would set the modem at a different bit rate and offer fewer e-mail addresses," Bosco explained. "Or we could offer business users quality of service (QoS) guarantees. This allows you to do that."

With the pressure on to differentiate services and quickly deliver bundled voice, video and data, provisioning middleware such as Cisco's Subscriber Registration Center will play an increasingly important role. CT

Jennifer Whalen is editor of "Communications Technology." She can be reached via e-mail at jwhalen@phillips.com.

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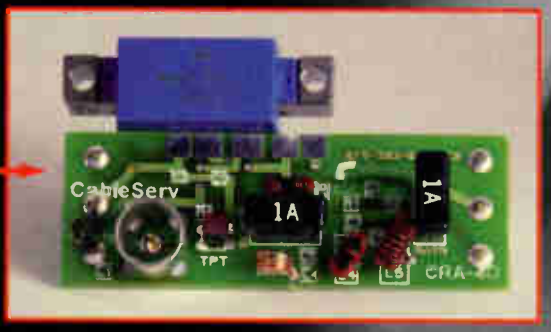

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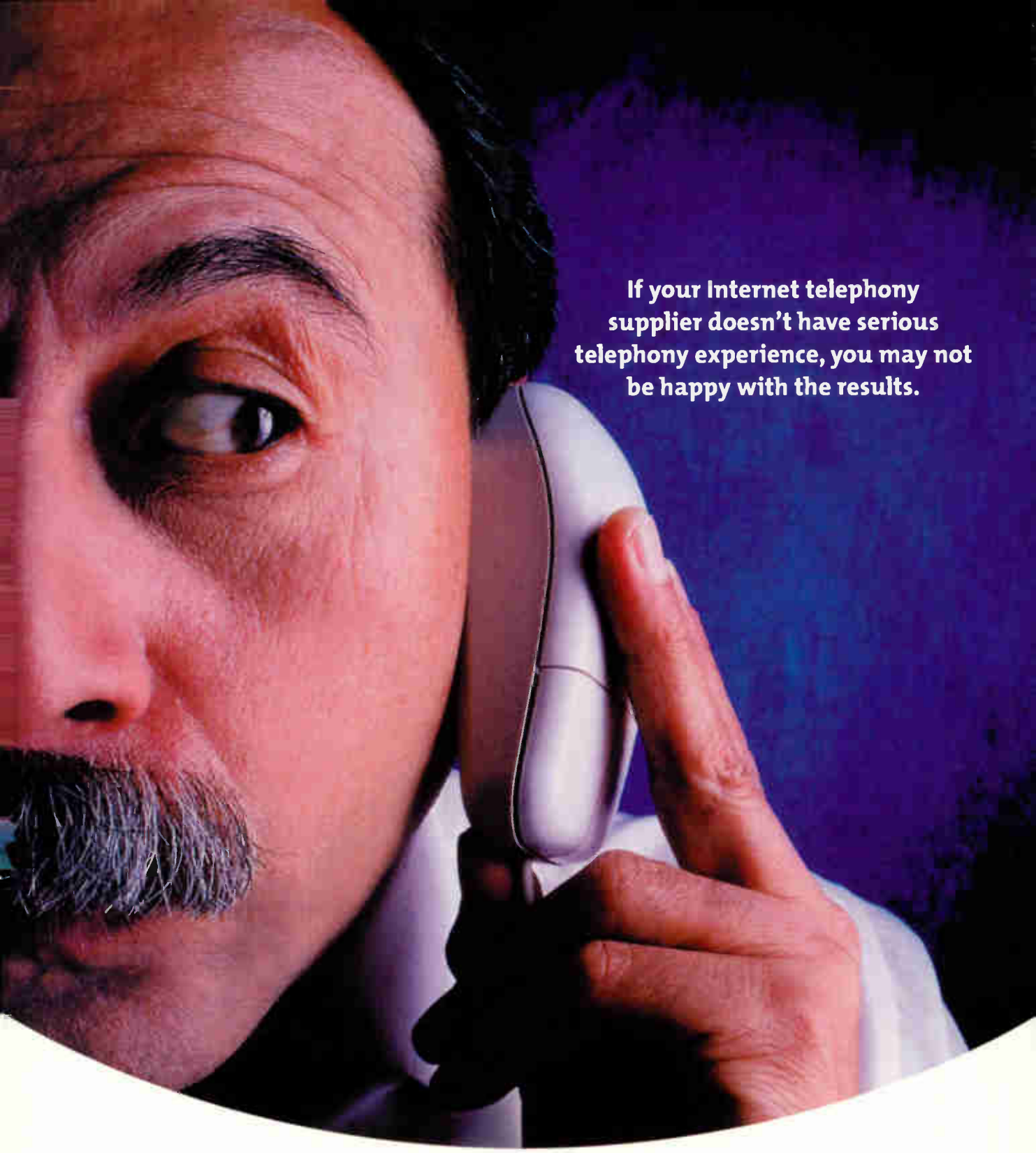

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How the world shares ideas.

Original photo (headend) courtesy of Scientific-Atlanta

Headends Go Digital

Open the Door to the Future

By Arthur Cole

Rick Glover, headend manager at Cable TV Arlington and Montgomery counties, outside of Washington, D.C., looks over the six racks of equipment that make up the system's new digital headend.

"We have 130 digital channels taking up one fifth of the space it takes to run our 78 analog channels," he says. "We plugged it in and had digital pictures in the headend on the first day. We were able to get pictures in the field after a short series of tests."

Welcome to the era of the digital headend, where fewer devices in fewer headends will produce cleaner, more robust signals, and monitoring and repairs in the network can be done quickly and easily from a central computer.

But if you think digital technology is going to make your life easier, forget it. Digital is going to turn your once-simple TV operation into a telecommunications powerhouse, simultaneously carrying gigabits of data in dozens of formats and encoding schemes. That's going to mean more complexity, more racks of equipment and more demand placed on the headend. ➤

Photo courtesy of Harmonic

Digital headends of the future will support a growing mix of voice, video and data services.

Cram it in the headend

Probably the most significant impact that digital will have on your system will be the ability to consolidate active components in the headend. In large systems, this will offer an opportunity to run the network from what some are calling a "super headend" while converting the smaller headends to unmanned hubs. In short, the cable plant will mirror those of the telecommunications carriers, which are controlled from massive central offices.

"We started the process four years ago, and it hasn't changed," says Butch Robertson, manager of AT&T's Western Cable Division, consisting largely of former TCI systems in the San Francisco area.

Robertson said he is outfitting secondary hubs with simple optical regeneration equipment, moving the active gear into consolidated headends. This allows the company to remove a lot of redundant gear that was spread across multiple headends, reducing perhaps 20 racks of equipment for a typical 300-MHz system to just two. Not only is this a more efficient use of hardware, but people as well.

"It allows us to redirect our personnel so that the remaining headends can be staffed 24/7," Robertson says.

Although network management is simplified under this arrangement, these new headends will require a lot of expertise to run smoothly.

"Things are going to get much more complex than today," says Colin Boyd, vice president of North American and worldwide markets at Harmonic Inc. "In cable's past life, HITS (Headend In The Sky) and HBO (Home Box Office) were simply remodulated to a box in the home—it was a straightforward one-way broadcast. Now, with multiple services and interfaces with ISP (Internet service providers), satellite and telephone providers—not to mention two-way service—there's a lot more going on."

Consolidation trade-offs

However, bringing all the active components into the headend may be a tempo-

rary solution. As more subscribers come online, there eventually will be a need to push more active components back out into the field.

"It's a cost trade-off," says David Grubb, vice president of marketing for General Instrument's Transmission Network Systems business unit. "It's the cost of maintaining multiple locations vs. the cost of transporting signals to a master location."

Some of the benefits of a central location are quicker response times in case of outages or other problems, and you can share equipment over a large population of subscribers. But as more subscribers come online demanding data and telephony, the network is quickly maxed out. Take, for example, a return path of 5-40 MHz on a 1 Gbps fiber link. The actual data being carried is between 20 to 40 Mbps. The rest is overhead.

"Right now, it makes more sense to pay the cost of a more expensive transport because you can share headend costs and avoid having multiple CMTSs (cable modem termination systems)," Grubb says. "With more data, it may make sense to put multiple CMTSs in the node."

Some larger multiple systems operators (MSOs) already are planning for this eventuality. At Time Warner, new services such as Road Runner and video-on-demand

BOTTOM • LINE

A New Look for the Digital Headend

Digital headends coming online today are an engineer's dream. Most devices are plug-and-play, and with a few simple tests, you can send digital video to your subscribers with barely a fifth of the gear that is needed for analog.

But don't be fooled by the calm before the storm. As new services gain in popularity, your headend will become Grand Central Station for a wide range of data types, protocols and encoding formats. And remember that one-way satellite feed? Yes, you'll still have that, along with two-way interconnections with telephone companies, Internet service providers (ISPs) and other headends.

All of this will dramatically increase the complexity of your daily lives. Even the process of converting to digital is going to seem like chasing your tail for some of you. Digital technology initially will make it cost-effective to consolidate active components in the headend as a way to share resources, only to be pushed back into the field as the demand for data services puts a strain on your plant's transport system.

Fortunately, there is an upside. Uncertainty, after all, breeds opportunity. Not only will digital make the cable engineer's job more interesting and diverse, it also will offer hefty rewards for those who can master the intricacies of the technology.

Fire suppression, such as this FM200 system in Cable TV Montgomery's headend, becomes increasingly important as headends deliver a complex mix of must-have digital services.

(VOD) will begin with servers in the headend, according to Paul Gemme, vice president of plant engineering.

"As business picks up, we'll start to migrate (servers) to the hub sites," says Gemme. "Our architecture allows us to make decisions on a hub-by-hub basis, rather than ubiquitously across the entire system. It lets the business dictate where we spend the money."

Still, growing numbers of digital subscribers will have a direct impact on the headend, something most cable operators are not accustomed to. In the analog realm, new subscribers may have meant additions to the network, but the headend remained untouched as long as the channel count remained the same. With digital services, telephony and all the other goodies, new subscribers will mean more routers, muxes, lasers and the like.

Goodbye, "business as usual"

Reliability also will play a greater role in the headend and the field. Unlike the analog video days when loss of service produced little more than a few angry phone calls, an outage during a VOD event now means an immediate hit in revenues. As a result, the status monitoring and remote control side of the headend likely will grow.

All of this new gear will require a more suitable environment than traditional analog headends provide. Digital boxes are susceptible to heat, dust and moisture, so climate control will be a primary concern. You don't want all that fancy gear lost to fire, so new chemical fire suppression systems will be needed. Static electricity can cause digital circuits to fail, so you'll have to select the proper flooring, not only in the equipment room, but in reception areas, lounges and elsewhere. Clothing also will be a factor—absolutely no wool, even in winter.

New skills for a digital age

For cable engineers, the added complexity certainly will make the digital headend more difficult to operate. But it also will provide more opportunities and a greater ability to diversify. Getting tired of the video scene? Make a switch to broadband data or Internet protocol (IP) telephony. Specialists in every field will be in great demand, but it will be those with a well-rounded knowledge of digital communications who stand the best chance of breaking into upper management.

> Moving to digital platforms will allow you to consolidate active components in the headend.

One key set of technologies to bone up on? Transcoding: converting signals from one data type or protocol to another.

"It used to be all you needed was someone who was something of an expert in television and AV (audio/visual) subcarriers," says Dean Rockwell, director and general manager of headend systems at Scientific-Atlanta. "In the future, we'll need database expertise and knowledge on converting between analog and digital modulation schemes, TCP/IP (transport control protocol/Internet protocol), ATM (asynchronous transfer mode), SONET (synchronous optical network), as well as formats on the optical side."

Open vs. closed

Still to be determined is whether open architectures or proprietary systems will reign in the headend. CableLab's OpenCable format will allow the consumer boxes to work across platforms, but that does not mean all systems in the plant have to be open.

"You're going to see several different formats in the headend," says Jim Lacey, director of sales for Blonder Tongue. "The headend will continue to have proprietary boxes because the manufacturers won't be forced into (open standards)."

An open architecture design certainly will afford a variety of lower-cost solutions from multiple vendors, but invariably, some killer applications will remain proprietary for the vendor to retain a competitive edge.

So this is how the digital world is shaping up: simplified but more complex; greater revenue potential, but more competition. Sure, the old analog way was fun and profitable, but the challenges awaiting us in the future are what make life worth living. CT

Arthur Cole is contributing editor to "Communications Technology."

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NEC '99 Eclipses

Previous Electrical Codes

By Jonathan L. Kramer

Just a few short years ago, the thought of measuring 90 V on a subscriber's drop would send chills down the spine of any field technician. A first thought might likely be, "Okay, how did the sub's tap fail?" Today, the same tech might say, "Cool! A telephony sub!" How times change.

While the technical platforms that drive our cable systems have rapidly evolved to support telephony and data services, the National Electrical Code (NEC) rules governing subscriber installations in most U.S. communities have been slower to keep pace with our technical developments. Moreover, once new rules are added to the NEC, the adoption of those new rules at the local government level often proceeds at little more than glacial speed. Many governments are just now getting around to adopting the 1996 NEC.

For the past 30-plus years, cable TV system drops and in-building cable system wiring have been governed by the ever-expanding NEC Article 820, titled, "Community Antenna Television and Radio Distribution Systems." In the newest edition of the NEC, the code authors have added an entirely new section, Article 830, titled, "Network-Powered Broadband Communications Systems."

Let's explore some of the similarities and key differences between our old friend, Article 820, and the new kid on the block, Article 830. We'll presume that your local government has adopted the 1999 NEC as its electrical code. (But beware. Your local government may be using an older version—see the sidebar "But the Code Says I Can!" Part 1 on page 58.)

Some new terms

When dinosaurs roamed the earth (that is, before the release of the 1999 NEC), we didn't have NEC definitions to describe the key elements of modern broadband networks. Section 830-2 of the new code offers some helpful definitions of the brave new world we've entered:

"Network Interface Unit (NIU). A device that converts a broadband signal into component voice, audio, video, data and interactive services signals. The NIU provides isolation between the network power and the premises signal circuits. The NIU may also contain primary and secondary protectors."

"Network-Powered Broadband Communications Circuit. The circuit extending from the communications utility's serving terminal or tap up to and including the NIU."

The first definition certainly seems to cover just about everything we could conceivably want to carry to and from our subscribers. As for the second definition, if you don't mind, I'll continue to call it "a drop" rather than a "network-powered broadband communications circuit."

Good news—you know most of it

Here, the "it" is Article 830. That's because the new article is based on (and in many cases copied directly from) Article 820. Most of the extensions that differentiate Article 830 from Article 820 flow from the logical outgrowth of sending more than 60 V at an appreciable current level down a drop and into a subscriber's structure.

The same basic on-building installation techniques apply under both articles. Likewise, the requirement that you must use listed drop cables is found in both articles. A limited exception to the listing requirement in Article 830-5 permits the use of some unlisted coaxial cables that were installed before January 1, 2000. Thereafter, you'll have to ensure that you use drop cables specifically listed for use on network-powered broadband communications circuits. ➤

You'll also find in both articles requirements that you use special fire-resistant jacketed cables when you install them in air plenums and firebreak areas.

The drop grounding requirements of both codes are nearly identical, but in an interesting twist under Article 820-40(a)(3), the ground wire must be no smaller than 14 gauge, with no limitation of the maximum wire size. Under Article 830-40(a)(3), the minimum wire size remains 14 gauge, but the maximum wire size need not exceed 6 gauge, regardless of the maximum shield current that might be encountered.

Better news—you get to learn more

Under Article 830, the in-building wiring after the NIU must comply with NEC Article 800, which "... covers telephone, telegraph (except radio), outside wiring for fire alarm and burglar alarm, and similar central station systems; and telephone systems not connected to a central station system but using similar types of equipment, methods of installation, and maintenance."

In case this seems a bit too straightforward, the NEC Handbook explanation of Article 800 says, in part:

"Although information technology equipment systems are often used for or with communications systems, Article 800 does not cover wiring of this equipment. Article 645 provides wiring requirements for wiring contained solely within an information technology equipment (computer) room. See Section 645-2 for the definition of information technology equipment room. Article 725 provides wiring requirements for wiring that extends beyond a computer room.

"In some cases, the telephone system wiring is also used for data transmission; this use is covered by Article 800."

The bottom line is that once you install an NIU at a subscriber's structure, the body of NEC rules you must follow expands dramatically.

Let's move on to the some of the other key differences between Articles 820 and 830. ➤

BOTTOM • LINE

NEC '99 Changes

Cable's evolution from a simple delivery conduit for entertainment video into a sophisticated "fat pipe" for video, data and telephony generated pressure to update the primary regulatory safety code that governs cable subscriber installations.

We've learned that the 1999 National Electrical Code (NEC), which will be adopted by a majority of local governments over the next few years, will change and upgrade the techniques we employ to install subscriber drops, network interface units (NIUs) and associated equipment. We've also visited some of the more common ways a cable operator can run afoul of the new rules.

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Reader Service Number 40

Who's calling, please?

Section 820-4, titled "Power Limitations," says that you can use coaxial cable to "... deliver low-energy power to equipment that is directly associated with the radio frequency distribution system if the voltage is not over 60 volts and if the current supply is from a transformer or other device that has energy-limiting characteristics." This isn't going to help you if you intend to power an NIU at a subscriber's structure.

Compare Section 820-4 with new Section 830-4, also titled "Power Limitations," which deletes the reference to coaxial cable and permits you to send up to 150 V to the subscriber's NIU. These changes make sense, especially when you're using coaxial drop cable with embedded twisted-pair telephone wires. If you intend to ring your subscribers' telephones using your cable system power, plan on living under Article 830.

How are NEC Rules Made?

The 1999 National Electrical Code (NEC) traces its roots back to 1897 when the first national electrical code was published by the National Board of Fire Underwriters. Today, the National Fire Protection Association, a private nonprofit open-membership organization, oversees the development of the NEC. Based on public input from its members, including governments, manufacturers, installers and users, the code-making panels of the NEC recommend new or changed rules to the full membership of the NEC (typically once every three years). Once the NEC rules are adopted by a vote of the NFPA membership, they are published and made available for local, state and federal government agencies to adopt as their own electrical code. Governments in other countries also look to the NEC to provide the rational basis for those foreign government electrical codes.

Subs will be subs

In a telephony environment where we're sending some serious voltage and current to the subscriber's NIU, an important consideration is, "How do we protect subscribers from themselves?" Specifically, how do we protect them from receiving a nasty little electrical surprise when they're holding a can of beer in one hand, standing barefoot in a puddle of water, and using a dull old pair of rusty pliers to saw through the drop so they can install their own splitters to add yet another outlet? Article 830-10, euphemistically titled "Protection from Damage," tells us at Section 830-10(i)(4) that for overhead drops:

"Network-powered broadband communications cables attached to buildings and located within 8 ft. (2.44 m) of finished grade shall be protected by enclosures, raceways or other approved means. Exception: A low power network-powered broadband communications circuit that is equipped with a listed fault protection

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"But the Code Says I Can!" Part 1

I frequently point out to system operators that they may be violating a provision of the locally-adopted electrical code, based on the National Electrical Code (NEC), for one reason or another. The most common retort I hear is, "Yes, but under the newly-issued NEC rules, we're allowed to ...."

The NEC is crafted and issued by a private organization and may sometime later be adopted by the local government agency responsible for electrical code enforcement. The key words here are "may" and "sometime later."

Most governments do not automatically adopt the most current NEC version upon publication. In fact, it's common to see a local government adopt the NEC from two cycles back (six years!). This might well mean that although you can get your hands on the 1999 NEC today, your local government might just now be getting around to adopting the 1993 code.

If you're relying on using Article 830 for the installation of telephony services, you might be in for a "severe shock" when the local electrical inspector says, "Hey, stop it! You're not permitted to send 90 V down a drop!"

So, what NEC code year has your government adopted?

device, appropriate to the network-powered broadband communications cable used, and located on the network side of the network-powered broadband communications cable being protected."

Either we can protect voltage-carrying drops in suitable enclosures, or we can use a fault protection device at the tap end of the drop to cut off the voltage in the event of "an unfortunate subscriber experience." Hey, this section might even save the necks of some of our own installers.

How high is high? How deep is deep?

We have relatively few drop height rules under Article 820 and virtually no drop depth rules. Most of the rules that that control cable TV drop installations before the drop reaches the subscriber's structure are found in the National Electrical Safety Code (NESC) or in state-level codes often set by state public utility commissions (PUCs).

Article 830-10 ("Aerial Cables") adopts the NESC cable standards for drops. Generally, drops must be no less than 15.5 feet over roadways, at least 11.5 feet over driveways where trucks don't venture and no less than 9.5 feet over pedestrian-only areas. The same article also sets a general climbing space requirement on the pole of no less than 24 inches.

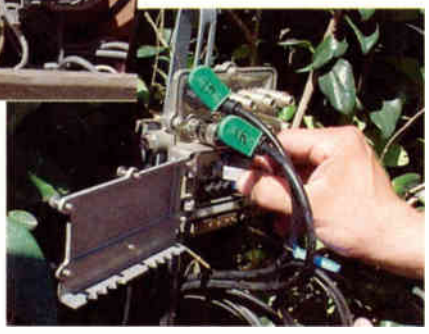
As for direct-buried drops, under Article 830-11, most will have to be buried at least 18 inches below grade, with a few exceptions that will permit 12-inch depths.

Why did the code-writers adopt formal spacing and burial rules? The NEC's "Fine Print Note" for Article 830-10 says it all: "Network-powered broadband communications systems contain sufficient energy to shock and kill. For that reason, they are

subjected to requirements similar to those for other high-powered circuits."

Wrapping up loose ends

A question sure to be raised is, "How do I know whether to apply NEC 820 or NEC 830 rules?" The simple answer is that if you (a) just use your plant to send broadband video or over-the-cable Internet services, and (b) you don't send more than 60 V down the drop, you're going to fall under the rules of Article 820. Once you send more than 60 V down a drop or install an NIU, you've moving up to the world of Article 830 (and Article 800, and maybe Articles 645 and 725).



Above: A technician verifies 90 V of power at the NIU. Right: An installer inserts a PCT pin into a power-passing tap, using a plastic sleeve to prevent shock. Photos courtesy of Cox Communications, Orange County, Calif.

A follow-up question: "Can my system fall under both Articles 820 and 830?" It's more than likely. Most of your subs (at least for now) won't subscribe to drop-powered telephony services that require you to install an NIU, so you'll install your cable TV and cable Internet subscribers under Article 820. Only those subs that take telephony services through an NIU will be installed following NEC 830 rules. Only in rare cases, such as when you're only installing Internet-over-cable to and through a computer room, will your system also fall under Articles 645 and 725.

Finally, "How do I get a copy of the NEC code?" First, ask your local electrical inspector what NEC code year your community has adopted or if some other code applies. I strongly recommend purchasing the NEC Handbook on CD-ROM for ease of searching and printing. The Handbook, whether purchased in book form or on CD-ROM, contains the entire text of the 1999 NEC, along with all of the notes and a tremendous amount of explanatory commentary not found in just the NEC. Many technical and most construction trades bookstores carry or can order the current NEC code book, Handbook, or Handbook CD-ROM. You also may purchase NEC materials directly from the National Fire Protection Association by calling (800) 344-3555 or (508) 895-8300 if you're outside the United States.

When it comes to knowing and applying the NEC to your system, it's not who

"But the Code Says I Can!" Part 2

Even if your local government has adopted the 1999 National Electrical Code (NEC), one sure-fire way to instantly lose a code argument with a local inspector is to say, "Our company's NEC consultant says that the rules clearly require you to allow us to ...." The 1999 NEC code contains the following language (only slightly changed over the past 30-plus years):

"This Code is intended to be suitable for mandatory application by governmental bodies that exercise legal jurisdiction over electrical installations and for use by insurance inspectors. The authority having jurisdiction for enforcement of the Code will have the responsibility for making interpretations of the rules, for deciding on the approval of equipment and materials, and for granting the special permission contemplated in a number of the rules."

In essence, this rule (found in the 1999 NEC at Section 90.4) makes it clear that the intent is that the code be locally interpreted by the adopting government agency (usually the city or county government) and that final authority for approval of equipment and materials, and the granting of special permissions, rests with that authority. Although the NEC has many "Fine Print Notes" to explain the code, those explanations are only advisory, rather than binding upon the local government adopting the code.

That's why it's always best to educate your local code inspectors and officials regarding important elements of the code. The local inspector already is your judge and jury—don't let him become your executioner.

you know, but what you know (and what you can show to your local inspector). It pays to know your code! CT

Jonathan Kramer is a senior member of the Society of Cable Telecommunications Engineers, a member of the International Association of Electrical Inspectors, and a director of the National Association of Telecommunications Officers and Advisors. His Web site is www.cabletv.com.

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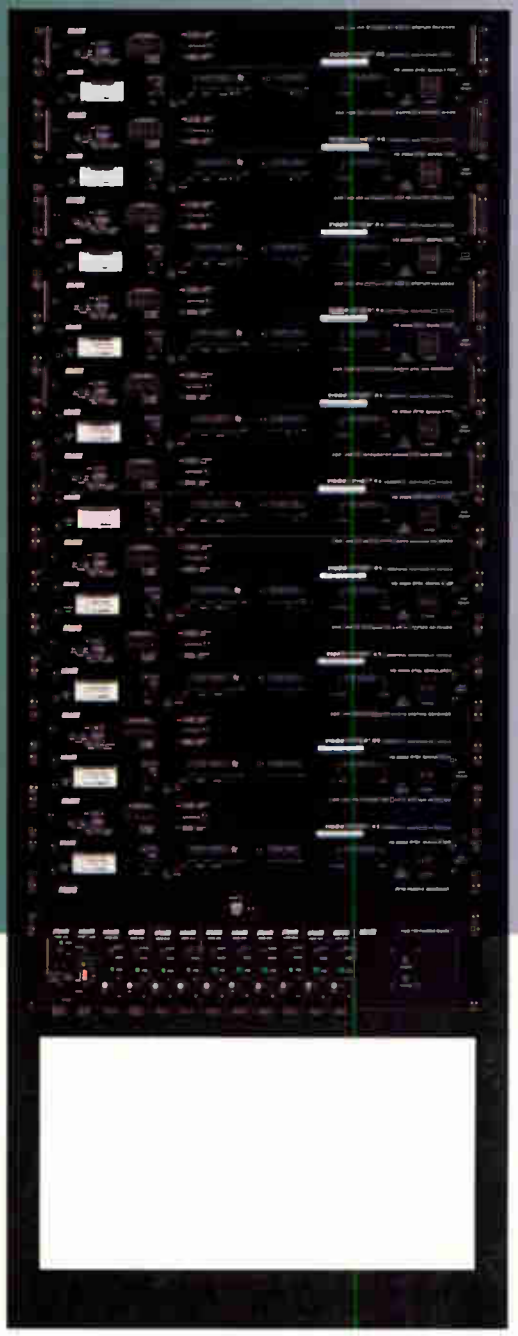

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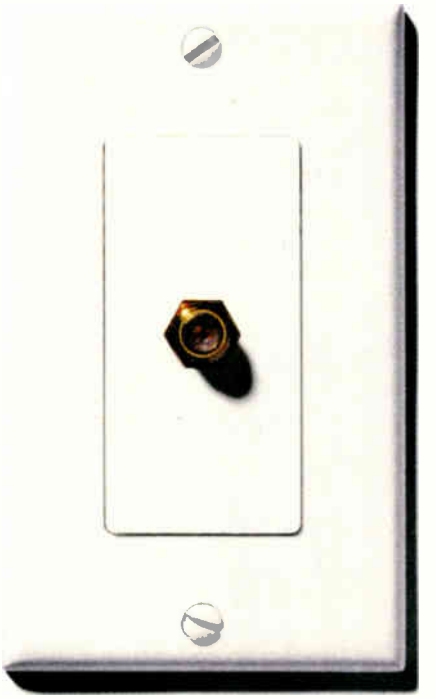

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Reader Service Number 47

The ABCs of

Add RF Capacity Without Rebuilding

By Mike Whitley

Cable operators are expanding into optical technology at a rapid pace that is likely to continue for some time to come. In short order, virtually all cable traffic aside from the last mile to the home will be in the optical domain.

Expanding reverse traffic capabilities will be key to increasing operator revenue potential. Also, getting signals transmitted from hub sites to headends for processing brings forth several challenges. Limitations in the number of fibers and hub site space, plus finding economical, yet expandable, electronics is important to the return signal path. Block conversion, or frequency stacking, is one way of solving some of these network issues.

Optics are great, but ...

Clearly, this optical domain is a positive development for the cable industry, and future development of optical technology, such as advanced lasers and dense wavelength division multiplexing (DWDM) will contribute to cable's growth as a telecommunications player.

Still, many cable engineers and operators are coming to the realization that RF technology will play a continuing role in the optical era because RF is likely to remain the primary connection between the home and the optical node. Multiplexing in the RF domain can be efficient and cost-effective in transmitting return path signals from the home to the headend for processing.

A technique known as block conversion is being deployed at cable systems around the world. Block conversion can be considered the RF equivalent of DWDM. Signals entering a converter are assigned a block, or group of frequencies, to keep them separate from other signals. Each block is then multiplexed onto a broadband RF stream, which ultimately is captured and demultiplexed into individual return blocks. (See Figure 1 on page 66.)

A DWDM system performs the same function, except that it assigns optical signals to specific frequencies or wavelengths of light.

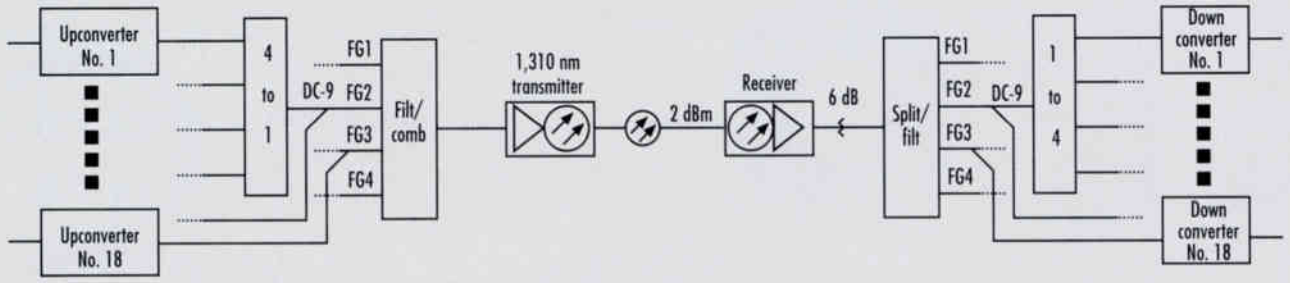
Why use RF?

So why bother with an RF system when all our training and experience indicates that optical signals are much cleaner and more efficient to work with? Three reasons.

Cost: The first is that the cost of block conversion can be less than DWDM. How much less depends on individual network architectures and the way in which the block converters are deployed. Some early adopters, however, are estimating block conversion at nearly half the cost of DWDM in transporting return path signals. ➤

Block Conversion

Figure 1: Block converter network, 18-block system



Source: ANTEC

"We have modeled savings of up to 42 to 45 percent in reverse path costs for the level of segmentation we require," says Oleh Sniezko, vice president of engineering at AT&T Broadband & Internet Services, in his 1999 NCTA technical paper, "Reverse Path for Advanced Services—Architecture and Technology." He continues, "Someone else could have a higher or lower savings depending on the architecture they are using."

Capacity: The second advantage of block conversion is capacity. Current DWDM technology combines eight wavelengths onto a single fiber, with 16-channel and 20-channel systems expected shortly. Block conversion technology available today can multiplex 18 5-42 MHz signals onto a single 870 MHz stream in the United States and can combine 12 5-65 MHz signals onto a single 870 MHz stream in other countries, says Dave Kirkpatrick, network applications engineer at ANTEC. That means every DWDM system carries eight return blocks per fiber, while a block conversion system delivers 18 return blocks per fiber. (See Figure 2 on page 68.)

Versatility: Third, because these technologies are multiplexing in two different domains, block conversion and DWDM can work together. With current block conversion and DWDM technologies, it's possible to take multiple block-converted bands and input them onto a DWDM transport device. Systems have shown the capability of multiplexing nine 5-42 MHz blocks onto a 16-wavelength DWDM system for a total of 144 return bands onto a single fiber, thereby exponentially increasing the network's overall capacity.

This approach can be most beneficial in systems that already are hitting bandwidth limitations with DWDM in place. In order to keep an all-optical network, operators can either wait for 16-wavelength DWDM to hit their price point, or they can add another eight-wavelength system and install additional fiber. Operators in urban areas know that this can be difficult. By simply installing block conversion, the extra capacity can be gained immediately, without having to install additional fiber.

What about loss of signal robustness in the RF domain? Performance of the block converters always will be limited in the network by the optical transport devices. As long as design rules are followed, the performance will suit all types of return signal modulation schemes: frequency shift keying (FSK), quadrature phase shift keying (QPSK) and quadrature amplitude modulation (QAM). The performance of the block converters individually is determined by three stringent criteria: dynamic range, frequency stability and phase noise.

Spanish system reaps the rewards

In Spain, Cable y Televisio de Catalunya (CTC) is installing block converters for the return path of its Barcelona franchise. The plan is to place converters at the hub level, combining multiple return signals from nodes together. At the hub, the signals are received from the optical nodes, converted to RF in the return path receiver, block-converted into a single RF stream, and then transported optically back to the headend. (See Figure 3 on page 70.)

Signal robustness is maintained, and the optical carrier handles the actual transmission. CTC will use block conversion to deliver data, telephony and videoconferencing services throughout the Barcelona area. ➤

BOTTOM • LINE

Block Conversion Relieves Return Path Congestion

Optical technology clearly is the wave of the future in cable system design, but there still is room for RF devices that can be used in conjunction with optical transportation components.

A prime example is block conversion (frequency stacking), a technique used to multiplex individual blocks of return bandwidth onto a single RF stream. The technology is the RF equivalent to dense wavelength division multiplexing (DWDM).

There are a number of reasons to deploy block conversion in a hybrid fiber/coax (HFC) network, including:

Reduced costs: Most operators will find the cost of block conversion very appealing for return band transport.

Lower fiber counts: Block conversion can mux up to 18 signals onto one fiber, reducing the required number of fibers between hub site and headend.

Smaller space needs: Electronic components can require extensive real estate inside a hub site; block conversion components can help reduce this requirement and simplify the overall network.

Remember that block conversion and DWDM are not mutually exclusive. Multiple channels of block converted signals applied to DWDM transmitters can offer a very high throughput.

As early adopters are finding out, block conversion can play a role in getting advanced services into the customer's home.

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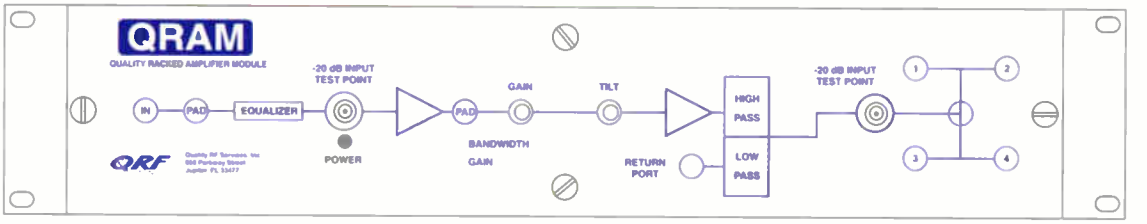
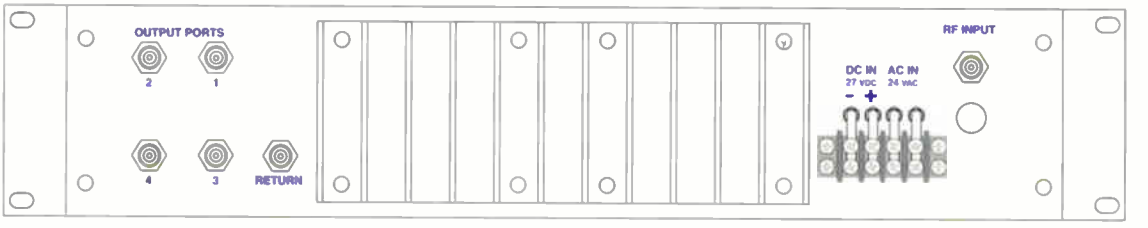


QRAM Front View



QRAM Rear View

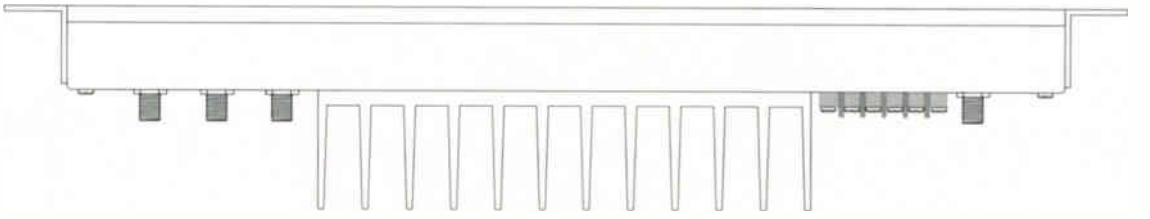


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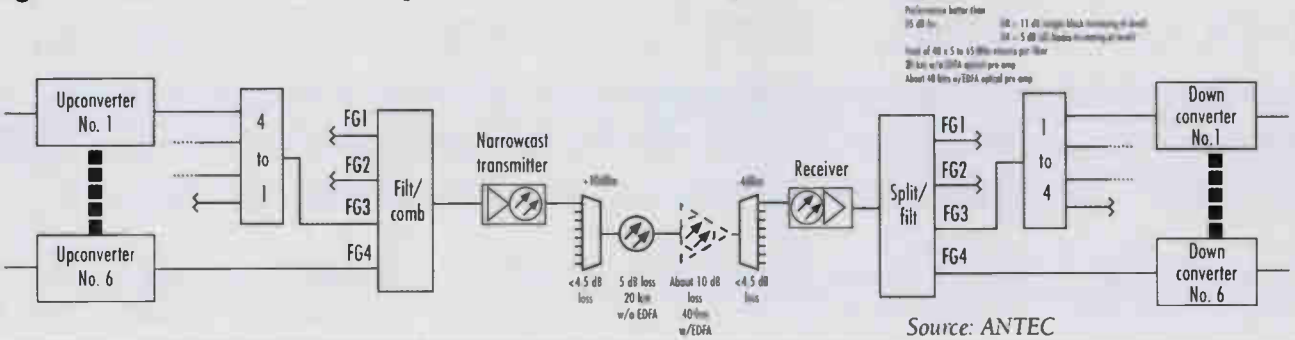
Figure 2: Block conversion system with six blocks per wavelength (8 λ)



Source: ANTEC

According to Jaume Salvat, director of technology at CTC, block conversion will allow the company to increase its return path homes-per-fiber ratio from today's 8,000 to more than 90,000.

"We have one hub with block conversion now," he says. "By the end of this year, we will have it installed at seven hubs. In seven years' time, we hope to be serving 1 million homes."

Not only are the block converters less expensive to acquire vs. comparable DWDM devices, but they also cut down on the amount of fiber that CTC has to run from the hub to the headend.

"We would normally run four fibers per hub to the headend," Salvat says. "Now, because of block conversion, we only use one."

Installation of CTC's block conversion is going smoothly, according to Salvat. The devices are practically plug-and-play, with no serious network or enclosure alterations necessary. No special equipment is required—the devices can be aligned using standard return path setup procedures.

Block conversion also gives operators all the segmentation and centralization benefits of DWDM at a reduced cost. By segmenting the return path signals onto their own frequencies, operators can centralize routers, interconnects, servers and other active components at the headend or central office. Not only does this cut equipment costs, but manpower usage also is more efficient because the actives can be serviced and monitored at one central location.

Keeping things centralized at a headend minimizes the physical space required for the hub and reduces real estate and buildings, which would add significantly to the overall cost of installing the network. ➤

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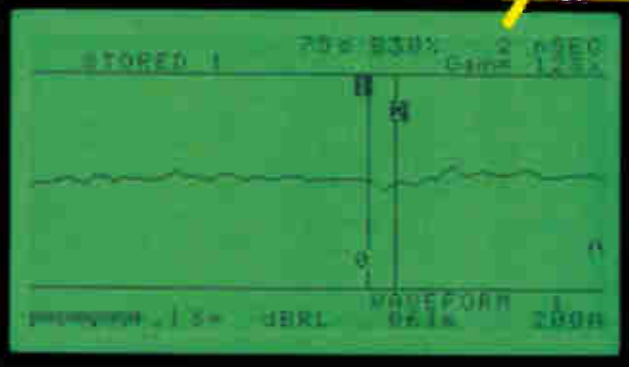

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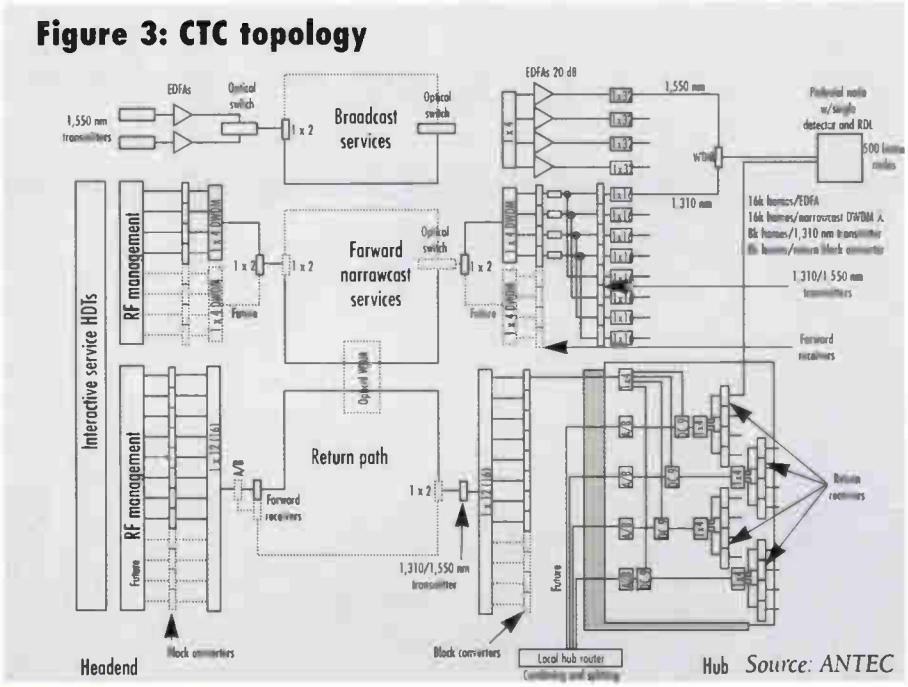
Figure 3: CTC topology



Is it right for you?

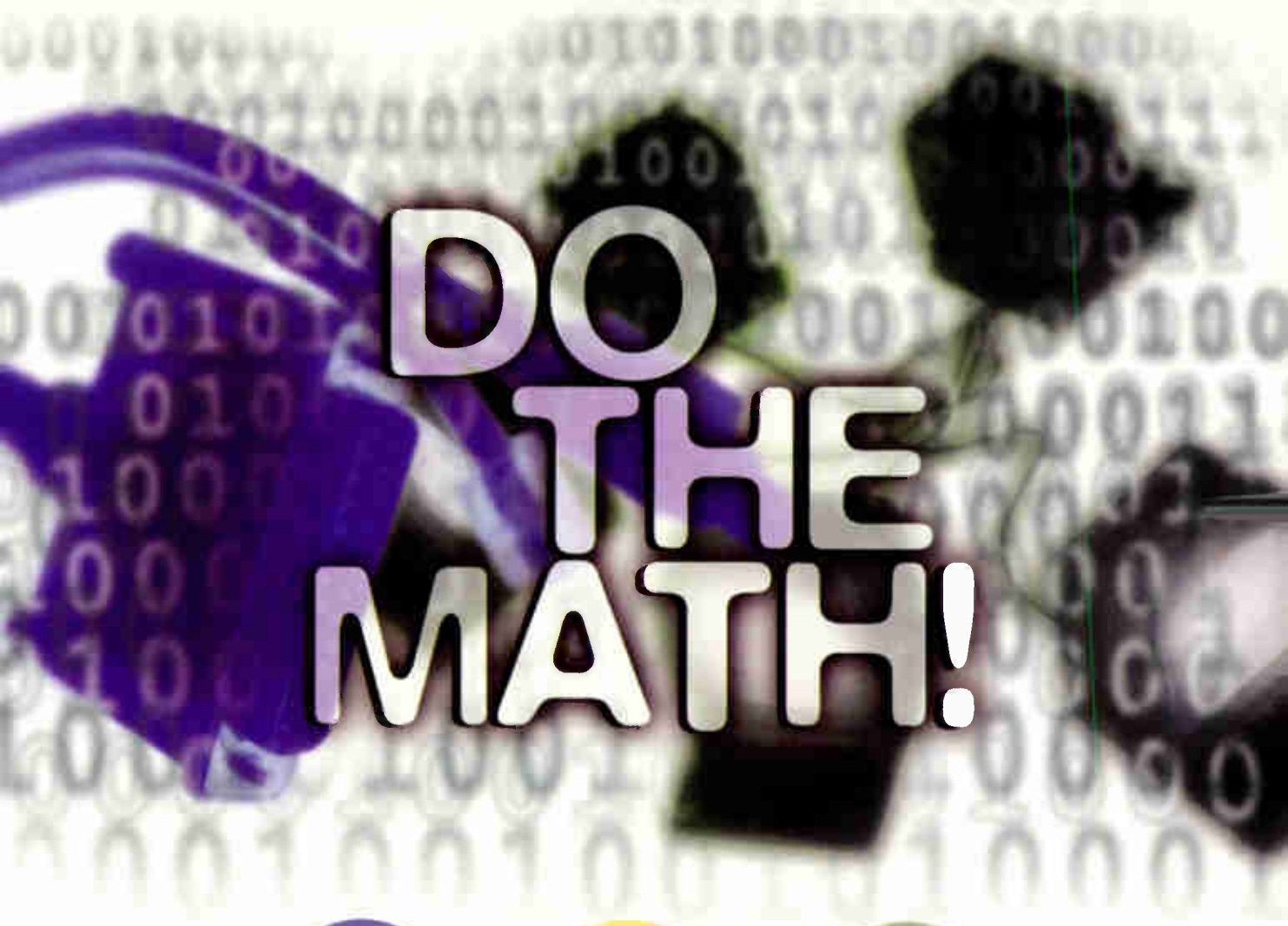
While block conversion helps make hubs more transparent and simplifies network operation, whether it's right for you depends on your architecture. Plants that can benefit the most are urban systems where the cost of installing new fiber and finding suitable hub sites is high.

"In both rural and metro areas, operators must first look at system construction costs," says Kirkpatrick. "Then, they must factor these costs against the advanced services they plan to deploy. These factors are critical to choosing a technology, whether it is all glass, block conversion or a combination of both."

There are many ways in which block conversion can be deployed. Depending on bandwidth needs, some operators may find it necessary to install block upconverters at the node, with the downconverter at the hub or even headend. A careful evaluation of anticipated bandwidth requirements at each stage of the network will be useful in determining the right approach.

What's important to keep in mind is that block conversion can be another tool used in the transport of return band signals throughout the network. As in CTC's case, the use of block converters can save in both cost and in the number of fibers required. CT

Mike Whitley is director of product management for outside plant at ANTEC Network Technologies. He may be reached via e-mail at mike.whitley@antec.com.



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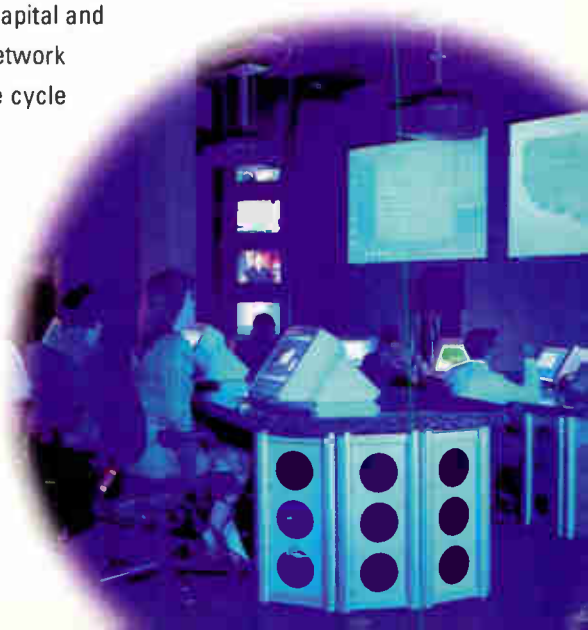

Reader Service Number 52

On Your Marks, Get Set ....

Prepare for Digital Deployment

By Ron Hranac

As competition heats up, more and more cable operators are going digital. Although digital deployment can help the company's bottom line, it also involves a slew of technical challenges. Are you ready? Here's some advice to help determine whether you are and guidance to help you if you're not.

Cable operators are finding that competition from other video service providers such as multichannel multipoint distribution service (MMDS) and direct broadcast satellite (DBS) is eroding revenues and cash flow. Finding alternative revenue sources has become a priority, and often this means deploying some sort of digital service.

For example, for systems with limited bandwidth, compressed digital video can, in some cases, accommodate the addition of several new channels without requiring a network rebuild. Adding these channels may generate enough incremental revenue to allow a cash-strapped operator to delay a complete rebuild while remaining competitive.

Other digital services being deployed by cable operators include digital audio, which provides several channels of compact disk (CD) quality audio, cable modems for high-speed Internet access, point-to-point data links for businesses, and even residential or business telephony.

Let's highlight a few of the major technical and operational issues to be considered prior to launching digital on an existing system. In other words, how can you prepare for digital?

Start at the headend

Regardless of the type of digital service you plan to deploy, initial considerations start with the headend. The first question to answer is how much space is available. This applies to space inside the headend building as well as outside.

For instance, if you plan to launch a satellite pass-through compressed digital video service similar to the Headend In The Sky (HITS) service, you may need to install a new satellite dish to receive the signals. Even though you are only installing a pass-through service, you still will need to add one or more racks of new equipment, including satellite receivers, data transcoders, upconverters, a digital access controller and other related hardware.

If you plan to originate your own compressed digital video programming, you will need room for compression encoders and multiplexers, conditional access (CA) control, video and audio playback equipment, and possibly even a studio with production and editing facilities.

Providing cable modem Internet access will require having space for one or two (or more) new racks of equipment, depending on the size of the cable TV system and the anticipated number of cable modem subscribers. These racks will be needed for:

- Router equipment
- Ethernet equipment
- Backbone access hardware (probably a minimum of a T1 outside link to the Internet)
- Dialup high-density modems for non-network access and telephone return (This equipment will require one or more PRI—primary rate interface—circuits between your headend and the telephone company.)
- Reverse path receivers and combiners
- Forward path transmission equipment
- Possibly a control computer for local access and modem configuration
- Cache and proxy servers
- Cable modem termination system (CMTS) equipment
- An appropriately sized uninterruptible power supply (UPS)

If you want to get into the circuit-switched telephony business, you will need a complete room for the switch, another for the battery system, and possibly yet another room or rooms for transport termination equipment and network management, although this can be colocated with the switch.

HSA Corp.'s J.R. Anderson suggests a minimum starting point for headend telephony space requirements of 1,000 to 1,500 square feet, but 3,000 to 5,000 square feet is more common. He adds that many operators underestimate building and real estate needs when considering telephony.

Plan for future growth

Talk to the service provider and equipment manufacturers to get an estimate of how much equipment will be installed, and the amount of space required for all of it, as well as special access requirements such as oversized doorways. Keep future growth in mind as you go through this exercise. As you review equipment requirements, space is only the first thing to consider.

What about electrical requirements? Is your existing electrical service up to the task of operating the additional equipment, or will it have to be upgraded? Don't forget about the quality and reliability of your headend's electrical service. Digital transmission equipment often requires the use of power conditioning hardware to clean up "dirty" power. A UPS—possibly in conjunction with a backup generator—will help with reliability. Improved

grounding and lightning protection bear consideration as well.

Next on the list is the heating, ventilation and air conditioning (HVAC) system. Its capacity almost certainly will have to be upgraded, especially the air conditioning equipment. If possible, design the HVAC with some measure of redundancy, so that equipment failure won't put the entire headend air conditioning system out of service. An upgraded humidity control likely will be necessary because too-dry air can lead to damaging static electricity. At the other extreme, excessive humidity also can be harmful.

A problem area that is easily overlooked is site security. When you begin providing digital services, especially something as critical as telephony, physical site security will have to be a major part of your deployment plans. Be sure to include computer and software security. Fences, video cameras and alarm systems may deter headend break-ins, vandalism and equipment theft, but appropriate firewalls will be necessary to keep hackers out of your system.

Finally, you'll need to carefully evaluate staffing needs. Most conventional headends essentially are stand-alone facilities, requiring only periodic maintenance visits. Depending on the nature of the digital service, you may find it necessary to have the headend permanently manned. Furthermore, as you move into the digital world, training will become an important part of your daily operation (more on this later). ➤

BOTTOM • LINE

Develop a Digital Plan of Attack

Competition is forcing us to look for new ways to generate revenues. Competing services are eroding our long-term growth. One way to deal with that competition is to consider new digital services such as digital video and audio, cable modems, and telephony.

If you're contemplating launching digital services, you need to develop a plan. Digital services deployment is a lot more than just ordering one or two racks of equipment and installing it in the headend. You need to look at every facet of system operation, including headend capacity, security, system maintenance practices, and even the condition of the network and drops. And this is the easy part.

The bigger challenges include training requirements for your installers, technicians and customer service staff. Even mundane things such as warehouse space must be addressed. Once you have digital service up and running, what about long-term customer support? You may find it necessary to create a 24/7 call center, perhaps in conjunction with someone who has expertise in this area.

There's a lot involved, and if you don't do it right, your competitors will.

Minimum Guidelines for Analog Operation

The Federal Communications Commission technical regulations for cable TV systems (FCC Rules, Part 76, Subpart K, Technical Standards) often serve as the basis for defining minimum acceptable system performance criteria for the launch of digital services. Here is a summary of key FCC technical requirements for analog operation.

If your system meets or beats these numbers everywhere and on every channel, you will have fewer problems deploying digital services than systems that don't meet these specs.

Parameters

Minimum visual carrier amplitude:
0 dBmV at the subscriber terminal; +3 dBmV at the end of a 30-meter drop

Maximum visual carrier amplitude:
Do not overload the subscriber's receiver or terminal.

Aural carrier amplitude:
10 dB to 17 dB below the visual carrier

Visual carrier amplitude change:
No more than 8 dB variation on any channel within any six month interval

No more than 3 dB variation during a 24-hour period between any adjacent visual carriers within the cable system bandwidth

No more than 10 dB difference between any two channels in 300 MHz systems, +1 dB for each additional 100 MHz bandwidth

Aural carrier frequency:
No more than +/- 5 kHz from nominal frequency (That is, for NTSC channels, the aural carrier must be 4.5 MHz +/- 5 kHz above the visual carrier.)

In-channel frequency response:
+/- 2 dB (For 6-MHz NTSC channels, this specification must be met from 0.75 MHz to 5.0 MHz above the lower frequency boundary of the channel.)

Visual carrier-to-noise ratio (C/N):
43 dB (relative to a 4-MHz bandwidth for NTSC channels)

Visual carrier-to-coherent disturbance ratio (composite triple beat, or CTB; composite second order, or CSO; cross-modulation, or XMOD; and so on):
51 dB for standard and incrementally related carrier (IRC) channelization; 47 dB for harmonically related carrier (HRC) channelization

Terminal isolation:
Minimum 18 dB and sufficient to prevent reflections caused by open- or short-circuited subscriber terminals from producing visible picture impairments at any other subscriber terminal

Low frequency disturbances (hum):
The peak-to-peak variation in visual signal level caused by undesired low-frequency disturbances is not to exceed 3 percent of the visual signal level.

Chrominance-to-luminance delay inequality:
170 nanoseconds or less

Differential gain:
Maximum +/-20 percent

Differential phase:
Maximum +/-10 degrees

Signal leakage (less than and including 54 MHz and greater than 216 MHz):
No more than 15 µV/m field strength at a 30-meter measurement distance using a resonant half-wave dipole

Signal leakage (over 54 MHz up to and including 216 MHz):
No more than 20 µV/m field strength at a three meter measurement distance using a resonant half-wave dipole

—RH

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Remember to plan for the space needed for additional satellite antennas as you launch digital services. MediaOne solved this problem at its Richmond, Va., headend with a rooftop installation.

Is your network in good shape?

Although some types of digital services will work fine on just about any network architecture, the system itself must be in good condition. In general, if a system is properly constructed, well-maintained, and provides reliable and high-quality analog service, then digital deployment will be a lot easier. One benchmark is compliance with performance specifications such as the Federal Communications Commission cable TV technical rules. (See the accompanying sidebar, "Minimum Guidelines for Analog Operation" on page 74.)

Network architecture and bandwidth are especially important for interactive digital technologies such as cable modems and telephony. Compressed digital video and digital audio services will work on traditional tree-and-branch coax architectures as long as the network and drops are in good condition. But interactive digital services benefit from small, segmented service areas provided by hybrid fiber/coax (HFC) architectures.

Smaller service areas, or at least the ability to easily migrate to smaller service areas in the future, are closely related to efficient reverse path frequency re-use and traffic management. They also allow the system to provide targeted services based on demographics and geography.

If you are contemplating telephony, the architecture will have to accommodate powering network interface units (NIUs) on the customer premises. It will require you to analyze the features of centralized vs. distributed powering, the use of power-passing taps, and the economics of siamesed drop cable vs. powering NIUs directly through the drop cable vs. powering the units from inside the home. ➤

Don't Fall off the Digital Cliff

Just when you get used to using your signal level meter (SLM) to set visual and aural carrier levels, using a spectrum analyzer for carrier-to-noise (C/N) and distortion measurements, and interpreting your broadband sweep receiver's display for troubleshooting frequency response problems, along comes digital!

In many cases, short of a full-blown outage from a cut cable or some other catastrophic problem, analog performance degradation is gradual. That is, as C/N gets worse, analog TV picture quality deteriorates. Even as things go from bad to worse, usually some semblance of picture and sound remains until things eventually fade into oblivion. Not so with digital. Things remain pretty much perfect until the so-called crash point, and then everything goes away. The difference between working and not working usually is on the order of 1 dB or less.

In an analog world, you generally can tell if things are getting bad. With digital, there is no visible warning. Unless you can make certain digital-specific measurements, you really have no way of knowing how close to this "cliff" your digital signals are.

What, you might ask, are those digital-specific measurements, and why can't conventional test equipment be used?

Many of the measurements we perform on analog TV and similar signals don't apply in the digital world. For digital, you need to consider a whole new suite of measurements, most of which require some specialized test equipment, or at least an upgraded version of some of the test equipment you're now using for analog measurements.

Fortunately, several test equipment manufacturers have instruments available that can make a host of measurements on digitally modulated carriers. In a few cases, it's even possible to upgrade existing test equipment firmware to at least allow accurate digitally modulated carrier power measurements.

If I were thinking about buying test equipment to make digital measurements, here are some capabilities I'd look for:

- Average power level
- Constellation display
- Modulation error ratio (MER, similar to signal-to-noise ratio, or S/N)
- Pre- and post-forward error correction (FEC) bit error rate (BER)
- Equalizer stress

Additional capabilities might include error vector magnitude, estimated noise margin, adjacent channel power, channel power-to-noise and severely errored seconds. When choosing test equipment for digital, make sure it can measure the specific signals carried on your network: 64-QAM (quadrature amplitude modulation), 256-QAM, coded orthogonal frequency division multiplexing (COFDM), quadrature phase shift keying (QPSK) and so on.

Some instruments can make all or most of the measurements I've just listed (and sometimes also analog TV channel measurements) in one box, but only for one or two modulation formats. —*RH*

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Beef up your maintenance plans

As you evaluate the network's condition, look closely at maintenance practices. If you have an effective preventive maintenance program, then the plant should be in very good condition. Such a program will have addressed broadband sweeping, active device operating levels, signal leakage and other performance criteria.

If you haven't had particularly good maintenance, you will need to improve the network's performance before launching a one-way digital service. Interactive digital services that use the cable network for bidirectional operation require that the system's overall quality and performance be even better, especially in the reverse path.

Even though digitally modulated signals technically are analog signals, they can be more susceptible than analog TV channels to network and drop problems such as ingress, loose connections, frequency response problems and improper equipment alignment. The industry discovered long ago that digital signals, even relatively simple addressable converter control carriers, force a system operator to do a better job.

Speaking of maintenance, once you begin to provide digital services, you'll quickly discover that you must add new maintenance practices to your daily operations. You still need to continue existing practices, but digital services require additional maintenance efforts.

One of the biggest problem sources when deploying digital services is the subscriber drop. Substandard installation practices and low-quality drop materials will cause performance problems with digital signals. For more information on this subject, check out the article "Bulletproof Your Drops," which appeared in the April 1999 issue of *Communications Technology*.

General Instrument's Joe Waltrich has outlined additional system considerations and precautions for deployment of digital services. They include the following:

- Verify that digitally modulated carrier levels are correct relative to analog TV channel levels.
- Avoid placing digitally modulated carriers in the so-called roll-off areas.
- Avoid locating digitally modulated carriers adjacent to trapped channels.
- Do not use broadband sweep in the digital channels.
- Be careful when transmitting digitally modulated signals through fiber-optic links. Operating levels are especially critical because of the potential for laser clipping.

For the most part, I agree with these precautions. For setting digital carrier levels, I highly recommend test equipment that has digital carrier power measurement capability built in. This type of equipment is readily available from several test equipment manufacturers and will provide more consistency and accuracy while avoiding potential errors that can take place when performing manual measurements using instrument correction factors.

My second comment on these precautions has to do with broadband sweep. I am aware of at least two manufacturers that have low-level sweep equipment claimed to be capable of sweeping through digitally modulated carriers with little or no interference.

My personal preference is to sweep the entire spectrum so that overall frequency response can be monitored for problems. Still, it would be a good idea to check first with the manufacturers of your digital transmission equipment for recommended maintenance practices.

Operations is the hard part

Dealing with technical issues and making the network and drops digital-ready are, believe it or not, the easy part of deploying digital services. In fact, the launching of digital will impact the entire cable TV system operation. At an SCTE Cable-Tec Expo training workshop, Cox Communications' Richard White summed it up quite clearly in the introduction to his presentation about digital video services:

"All areas of the business are affected by the introduction of digital TV (DTV). Marketing now has more services to sell—a definite plus. The customer has more programming choices, new services and new features—another plus.

"The technicians, engineers and management information system (MIS) operators on the other hand, have more channels and services to monitor and maintain while customer service representatives and installers have new services and technical requirements to learn.

"The increased time, resources and training required to deliver digital video can place a sizeable burden on the day-to-day operations of the system if one is not prepared to handle these demands."

Adding data services will require space in your headend for equipment such as cache and proxy servers, routers, Ethernet gear, and so forth. Photo courtesy of MediaOne, Richmond, Va.

Consider the warehouse, something seemingly unrelated to digital services. Most contemporary digital set-tops are much larger than analog converters, often approaching the size of a CD player or videocassette recorder (VCR). At the very least, White says, the larger set-tops will require more warehouse space.

If "burn-in" testing of new set-tops is performed in the warehouse, additional space may be required. And because

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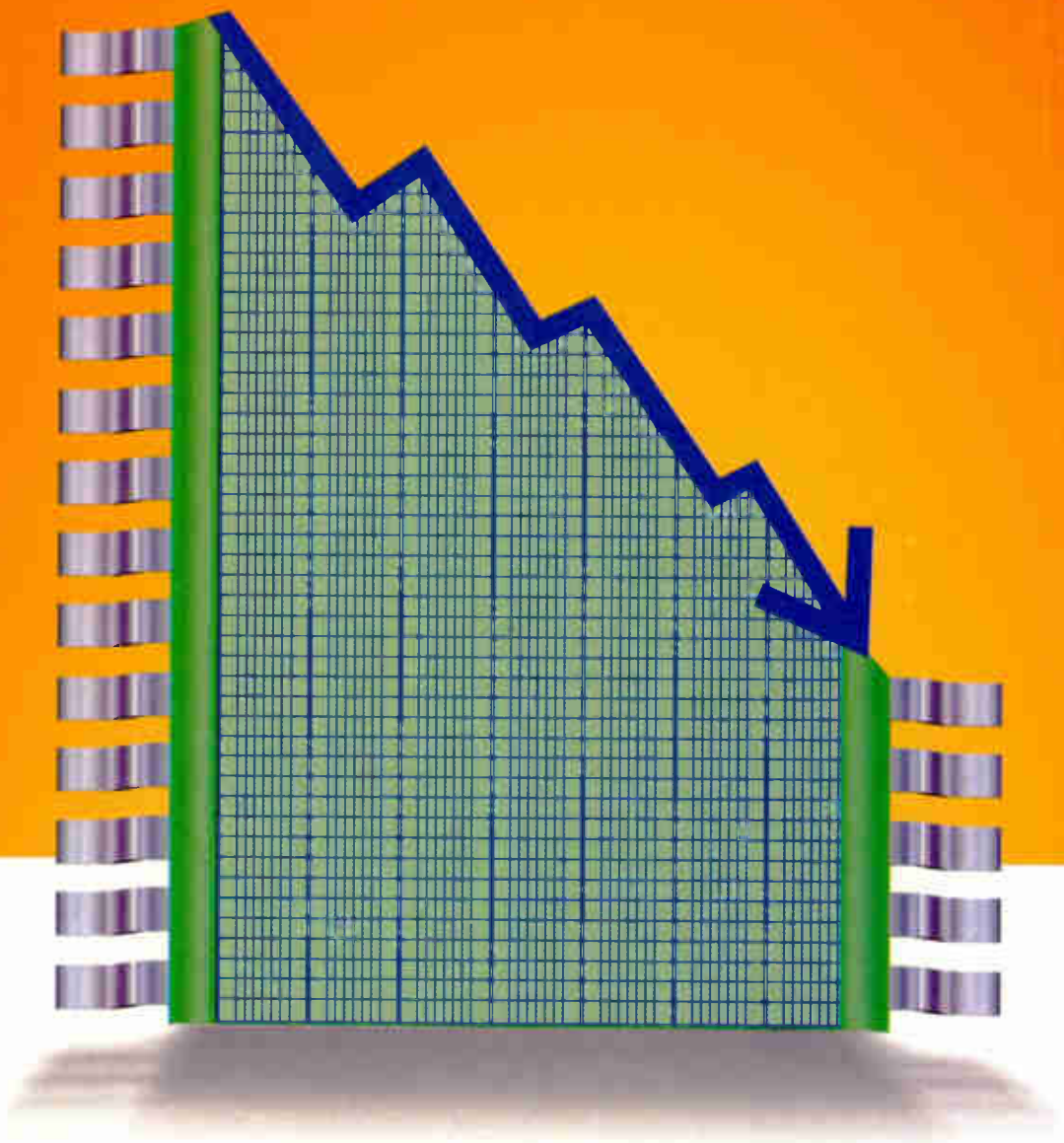

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digital set tops are worth several hundred dollars each, security of warehouses and technician and installer vehicles must be tightened.

Don't forget training

A critical operations issue is training. The installer, for instance, will have to be skilled in much more than just subscriber drop installations. Because of the variety of new digital services that will be available, the installer will have to thoroughly understand each of these services and, at times, be in a sales and marketing mode.

It will be unacceptable to our subscribers if they ask questions about one or more of the new services, only to be told by the installer—or customer service representative (CSR), for that matter—to call someone else for the answer.

Installers and technicians will require very broad skills that go far beyond RF and traditional cable TV technology. Installers of the future also will need to understand Ethernet, data and telephone networks, personal computers (PCs) and software, home security systems, addressable TV sets, videoconferencing systems, telephone network features, and wiring home appliances.

Customer service and support are important parts of digital deployment, especially for services such as cable modem Internet access. This type of service requires knowledgeable support staff and CSRs who can deal with Internet access questions, computer problems and software issues.

Some operators have partnered with local firms that have this expertise and staffing already available. Depending on market conditions and customer expectations, 24/7 call center support may be necessary.

Get cracking

Preparing for deployment of digital services may not be rocket science, but it does require a lot of preparatory and ongoing work in both technical and operations areas. This article has touched on a few of the major considerations, but obviously many other factors must be taken into account.

As we look for alternative revenue sources in today's competitive environment, emerging digital technologies appear to hold the most promise. We need to make sure our systems and personnel are ready for digital because if we falter here, our credibility will be at stake. No longer are we the only game in town, and consumers will take their business where they feel they are getting the most value for their money. CT

This article originally appeared in sister publication "International Cable" and has been updated.

Ron Hranac is vice president of RF engineering for High Speed Access Corp. He also is senior technical editor for "Communications Technology." He may be reached via e-mail at rhranac@aol.com.

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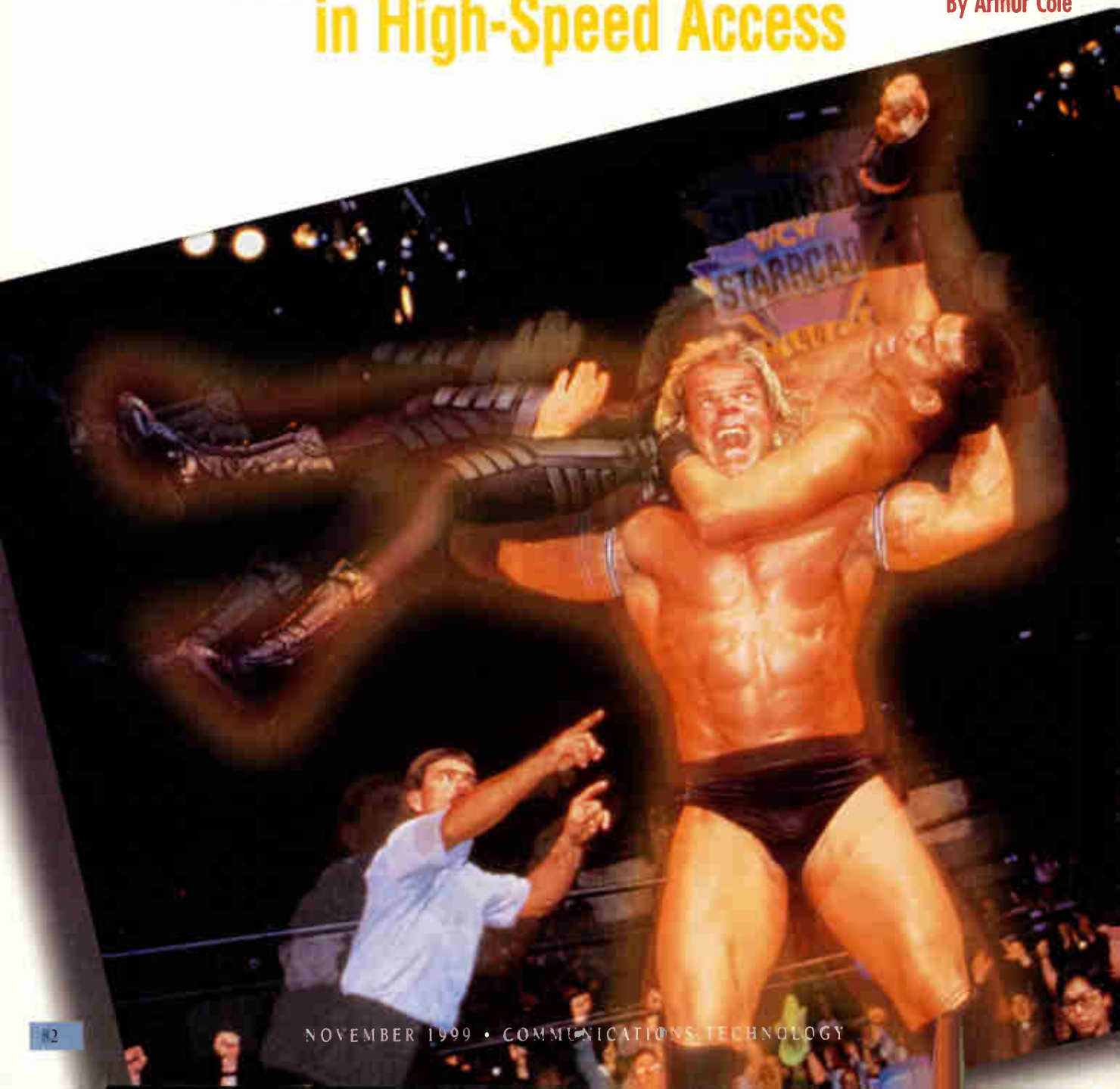
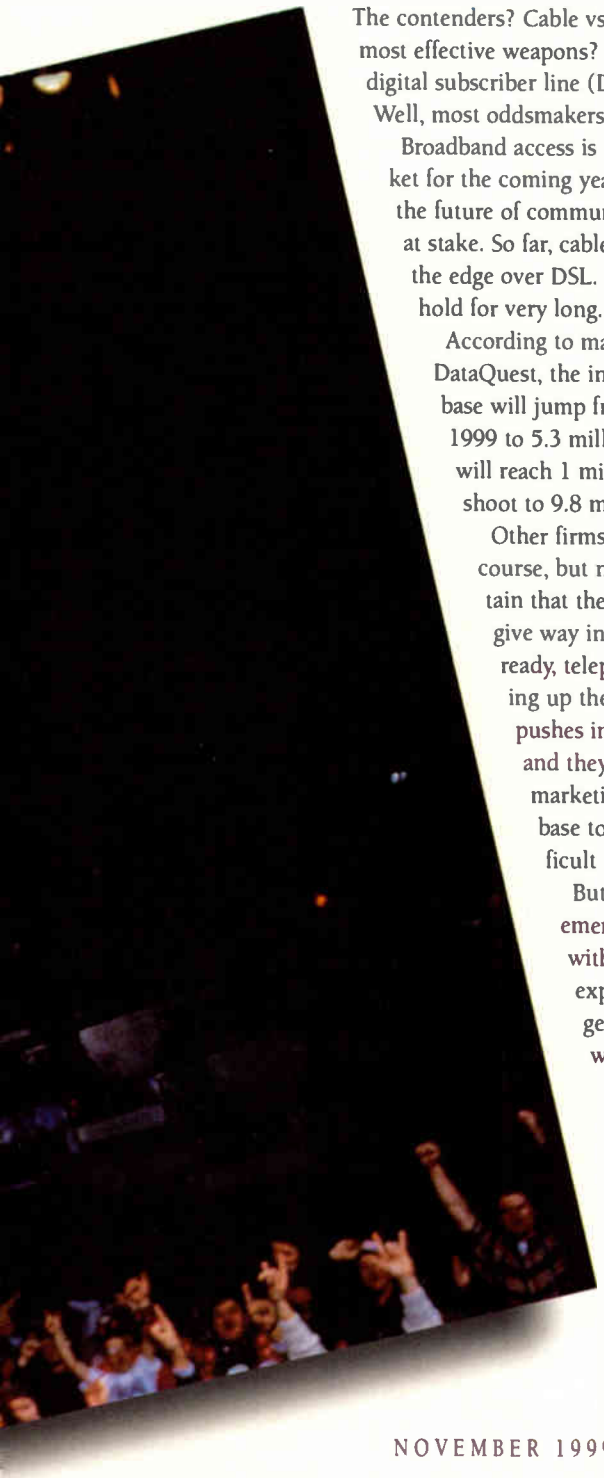
CABLE WRESTLES DSL

Competition Hot in High-Speed Access

By Arthur Cole



If 1998 was pre-bout publicity and 1999 is first-round sparring, then get ready for the title fight for the broadband championship belt in 2000.



The contenders? Cable vs. telco, of course. Their most effective weapons? Cable modems against digital subscriber line (DSL). And the money? Well, most oddsmakers are calling for a draw.

Broadband access is emerging as the hot market for the coming year, with nothing less than the future of communications as we know it at stake. So far, cable modem deployment has the edge over DSL. But that lead might not hold for very long.

According to market research firm DataQuest, the installed cable modem base will jump from 1.7 million units in 1999 to 5.3 million in 2003. DSL devices will reach 1 million this year, but will shoot to 9.8 million by 2003.

Other firms' numbers vary, of course, but nearly all analysts are certain that the cable modem lead will give way in the next decade. And already, telephone companies are lining up their resources for major pushes into the market this year, and they have the technology, marketing skills and customer base to make things mighty difficult for cable operators.

But if one thing has emerged from conversations with DSL and cable modem experts, it is this: Whoever gets to the market first will win it.

"It's better to be first than to be better," says Terry Shaw, project director for network systems at CableLabs. "You have to get systems rolled out in a timely manner."

"The first person into the home will have the customer," echoes Jeffrey Waldhuper, director of technology and engineering at Bell Atlantic. "Once a customer makes an investment, they won't want to go through the burden of changing it."

There are a lot of ways to gauge competitiveness in the broadband race. Let's start with technology.

Nuts-and-bolts comparison

Both systems will offer roughly the same throughput, about 1.5 Mbps. Yes, cable modems have been clocked at up to 30 Mbps (downstream), but actual speeds will depend on the type of modulation you use and the number of users allocated to a given downstream data carrier. Remember, you have a shared network, so the more people on at a given time, the less bandwidth per user.

Telcos, on the other hand, offer a direct line to the consumer. The drawback is that DSL is limited to roughly three-mile runs. Right now, that means nearly all DSL customers have to be located fairly close to a central office that houses DSL gear. The industry has only recently developed DSL access multiplexer (DSLAM) gear that is rugged enough for the field. But expect a pretty heavy rollout from here on in.

"A lot of telcos have installed digital loop carrier (DLC) systems," says Kevin Kahn, director of communication architecture for Intel Architecture Labs. "Instead of running a line to each house, they run a

What is G.lite?

G.lite is the new consumer digital subscriber line (DSL) standard recently adopted by the International Telecommunications Union. Although a voluntary standard, expect most vendors and telcos to conform to it for their residential systems.

G.lite provides a data rate of 1.5 Mbps downstream and about 500 kbps upstream. That's much lower than DSL's ultimate capability, but it allows telcos to push the signal farther out into the network. The chief benefit of G.lite is that it allows consumers to install their own modems, just as they do now.

"They're hailing G.lite as the great savior," says CableLabs' Terry Shaw. "You can look at it as a 'dumbed-down' DSL. They took the capability out to increase robustness."

Jeffrey Waldhuper, director of technology and engineering at Bell Atlantic, says the G.lite effort emerged in the mid-90s when the telco industry soured on video-on-demand (VOD) and thus had no real reason to deliver a higher data solution.

"The G.lite objective was to lower the cost of DSL to that of 56k modems," he says.

Does G.lite pose a particular threat to cable modem rollout? Not really. DOCSIS standards should provide the same amount of interoperability, and 1.5 Mbps is within easy reach for cable modems.

providers Covad and GST Telecommunications to deliver integrated voice and data over DSL to the business community. Of course, if the new LECs take customers away from cable, they'll take them from the major Bells, too.

What to do?

So what should the cable strategy be in the coming years? The answer is deploy, deploy, deploy. Right now, it's crucial to get your service in front of the people. The No. 1 complaint on the Internet today is slow download speeds. Whoever meets that need first should receive undying gratitude. CT

Art Cole is a contributing editor to "Communications Technology."

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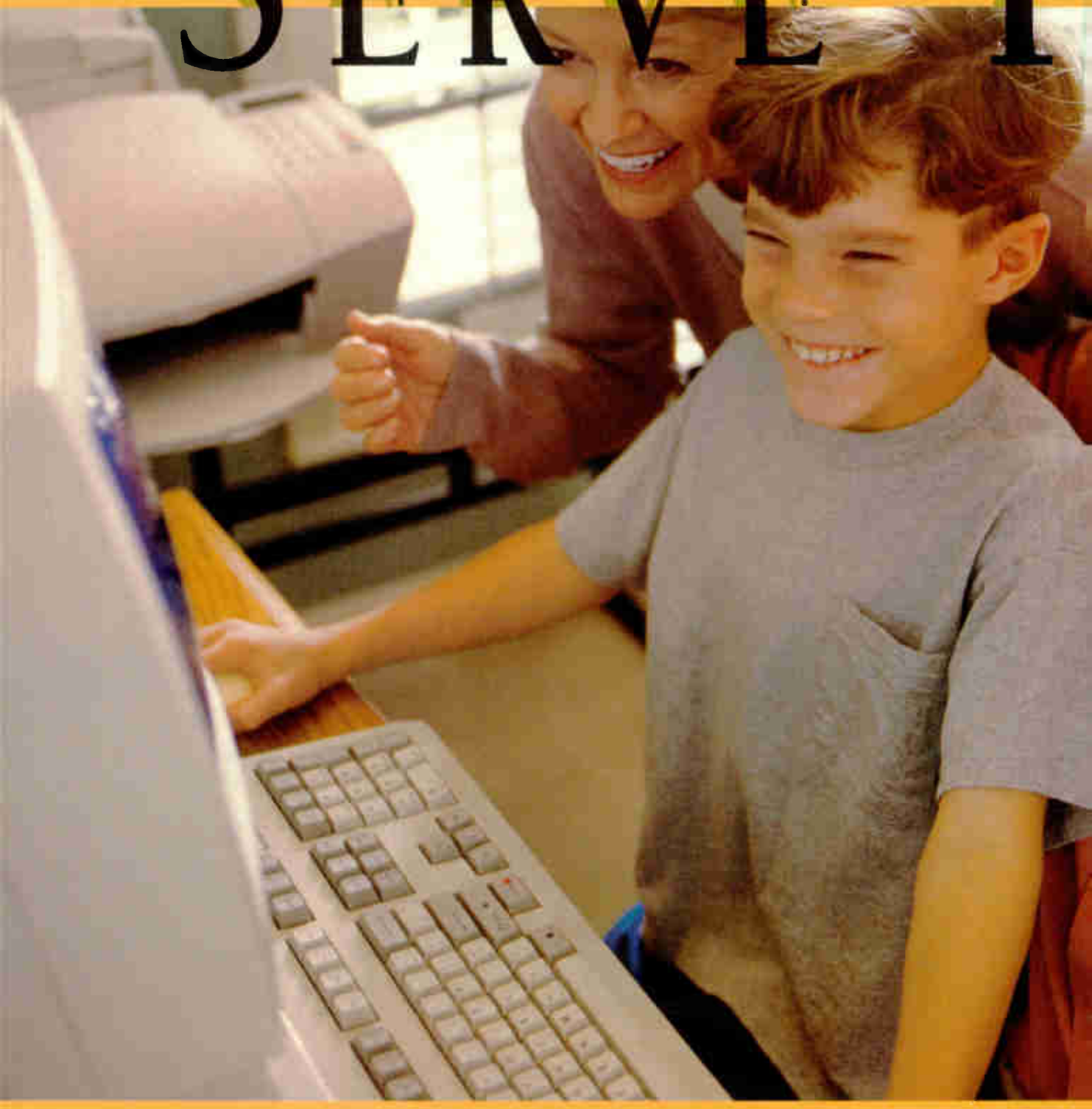

OURSELF

By Bruce F. Bahlmann

MediaOne Subs Test Cable Modem Self-Installation

So, you're all set to kick off your cable modem service, and scads of customers are clamoring for it. Life is good, right? Well, maybe not. Where are you going to find enough technicians to install service for all these fledgling super-surfers?

An all-too-likely scenario is that your once-eager customers will face long wait times for installation, and in the meantime, many of them may either change their minds or go over to your competition. What to do?

Self-installs

For MediaOne, a possible answer is to have our cable modem customers do their own installations. In our Minnesota region, we conducted a test among technically savvy subscribers to see whether self-installs were a viable proposition. We found self-installs quite workable, effectively growing the subscriber base and streamlining activation.

Figure 1 (on page 90) represents the sequence of events facing each cable modem customer. Today, many multiple systems operators (MSOs) must rely on internal employees to process each phase of the customer care process. If unaltered, this fact will limit their ability to scale the business.

The long-term goal of many MSOs is to provide an efficient self-service environment for customers. Although this self-service environment initially is intended for high-speed data, eventually it could support all products that use the broadband pipe, such as high-speed data, core video, telephony and so on.

What it is, what it isn't

The self-service environment is not intended to replace "traditional" MSO installations with self-service installations. Instead, the self-service environment merely provides additional installation and support options for customers. The combination of the proposed self-service environment as well as other MSO employee-driven efforts to install and support customers will provide a more scalable and cost-effective solution for expanding the Internet service customer base.

The result of customers' choosing some or all of these options will be an increase in overall customer care efficiency. When developing a self-service program, here are some possible metrics you can use to measure your success.

- Installation time: Self-installation can reduce average installation time spent by MSO personnel.
- Average installation cost: Because the average installation cost represents all high-speed data installations, this figure ought to decrease as the number of self-installations increases. ➤

Figure 1: Customer care process

- Percentage of customers self-installed: This refers to the portion of the total number of high-speed data installations that were completed entirely by customers. The availability of a fully functional self-service environment ought to increase the number of self-installs.
- Support calls per customer: As more maintenance tools become available through the self-service environment, the average number of support calls per customer ought to decrease.

A self-service environment must address all aspects of the customer care process and allow customers to independently select and then activate their Internet or other services. Once activated, the self-service environment must enable subscribers to make specific maintenance modifications to their Internet accounts without having to call technical support. Subscribers must be able to perform activation and maintenance operations via a convenient platform-independent (Web browser) application.

Most of this functionality also can be used to provide self-service subscriber maintenance (changing e-mail passwords, swapping network cards and so on). Achieving self-service subscriber activation involves automating existing "manual" activation tasks. It does not include wiring the home or installing the network card in the subscriber's computer. These tasks will be the customer's responsibility (in a self-installation) or an MSO installation technician's responsibility (in a traditional installation).

Simply allowing customers to activate their Internet service on their own is not synonymous with the primary goal of self-service activation, but rather just an additional way of installing high-speed data customers. In the end, the best self-service activation program supports a variety of options for customers with varying amounts of support from the MSO. A phased approach could continually add self-install options that require decreasing degrees of MSO support.

Our goals

The objective of our field study was to provide a means by which technically skilled individuals could wire, install, configure and activate high-speed data service on their own. We supplied qualified individuals (skilled in wiring and computer configuration) with an install kit and instructions that they could check out from a MediaOne service center.

Customers went home and installed the service at their convenience. Once complete, all customers answered a survey in which they provided feedback on their comfort level with the self-install. We used the survey results to help determine the proper costs (motivation/incentives) for this option, as well as to learn how to improve this process.

Field study

We conducted the study in our Minnesota region, with approximately 571,000 homes passed, all of which were high-speed data-capable. Minnesota had recently launched telco-return cable modem services, which were available to all the homes passed. The maximum possible throughput was approximately 1.5 Mbps forward and 33.6 kbps in the return.

Because of the recent launch of high-speed data services, we had a three-week backlog of new signups. A majority of the "earlier-adopters" were technically savvy, and many of them asked if they could do the install themselves. This initial customer demand prompted us to begin the field study. We had two goals in mind: Save the company money, and increase the number of installs that field technicians could do in a day.

The process

After approval of a project plan, we developed detailed processes to assemble the self-install kits, create our customer survey and distribute the kits. We defined a variety of steps for activating a self-install. They include:

- Tier 1 representative qualifies the customer's skills and dwelling
- Tier 1 representative initializes billing account and high-speed data services (select e-mail names and so on)
- Tier 1 representative schedules a "traditional" high-speed data install (See fail-safes.)
- Tier 1 representative arranges for pickup
- Customer picks up kit at service site
- Customer signs service contract and equipment release form
- Local coordinator reviews install steps with customer
- Local coordinator ensures customer's account is established and will enable

BOTTOM • LINE

"Do-It-Yourself" Cable Modem Installs

MediaOne conducted a field study of high-speed data self-installation with 83 customers in its Minnesota region. Customers successfully performed the wiring as well as computer and modem configuration necessary to activate high-speed data services.

Self-installs can result in better overall customer care efficiency.

- **Installation time:** Self-installation reduces average installation time spent by cable company personnel.
- **Average installation cost:** Install costs will decrease as the number of self-installations increases.
- **Percentage of customers self-installed:** The availability of a fully functional self-service environment will increase the number of self-installs.
- **Support calls per customer:** As more maintenance tools become available through the self-service environment, the average number of support calls per customer will decrease.

Figures 2-5

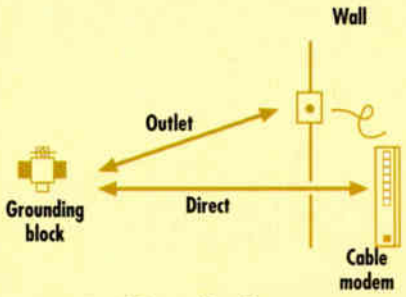

Figure 2: Self-install cabling

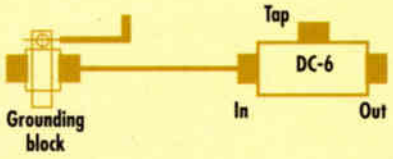

Figure 3: High-speed data splitter/ coupler connections

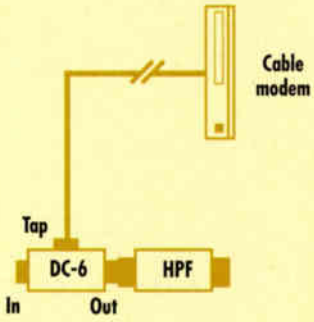

Figure 4: Use of high-pass filter

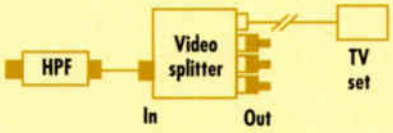

Figure 5: Video distribution system

customer to receive Internet service once install is complete
- Customer returns home to install kit
- Once installation is complete, customer answers the online survey
- Completed survey informs Tier 1 representative, who closes the install (without a truck roll), cancels the "traditional" install and activates the discounted service
- Tier 1 representative notifies customer, acknowledging receipt of the survey, cancels the now-unnecessary scheduled install and applies the discount

Screening participants in advance

Because our installation documents were not geared for casual to average computer users (many troubleshooting steps were not included), we screened customers for technical skill and the presence of required cabling in the home. Some of our screening questions included:

- Do you currently have MediaOne cable TV service?
- Are you comfortable opening a computer?
- Are you experienced in resolving interrupt requests (IRQs)?
- Do you know how to back out of changes made on a computer?
- Do you have a browser installed in your computer?
- Do you know how to terminate cable TV wire?
- Do you have access to the necessary tools (listed in manual)?
- Would you like to participate in the test, complete survey and so on?

We accepted customers who answered "yes" to all the questions into the self-install test group and proceeded with the next step in the process.

Fail-safes established

Additionally, we developed several fail-safes to ensure that the self-install ended with a satisfied and working customer. We put the following measures in place:

Traditional install date: We still scheduled customers who selected the self-install option for a "traditional" install. This date served two purposes. First, it preserved customers' installation priorities, allowing them to be installed at that date if they elected not to proceed with the self-install or couldn't complete it.

Second, it served as an end point for a given customer's opportunity to be part of the test group and be eligible for the discount. If customers failed to let us know that they had completed the install, and our technicians arrived at their homes, we billed them for the portion of the install that we had to complete. We then removed them from the test group and did not give them the discount.

Failed install: If customers couldn't complete the install because of a non-MediaOne problem (a buggy computer, for instance), they could request a service call from MediaOne to complete the install. If the service call was minor, we charged customers for time and materials, but they remained part of the test group and received the discount. If the service call was more like a full install, we charged the customers for an install and excluded them from the test group and its discounts.

Opt out: Customers who received the kit but no longer felt comfortable with the cabling could elect to have MediaOne install an additional outlet (AO). Because AO service orders come from the core video side of MediaOne, such a request likely could be serviced before the high-speed data install date. The customer would have to complete the customer premise equipment (CPE) installation and configuration and ensure the cable TV was connected per the self-install kit instructions.

Once complete, we charged the customer only for an AO service call, which generally is cheaper than a high-speed data service call.

Defective parts: If, for whatever reason, the customer suspected that any component in the self-install kit was defective, the customer could freely replace the component at any MediaOne service site.

Providing fail-safes allowed more people to become part of the test group while incurring minimum charges in exchange for MediaOne's performing some parts of the install. As a result, customers who did partial self-installs still saved money, just not as much as those who did everything on their own.

E-mail authorization

An important part of the qualification/ scheduling process was customer selection of an e-mail account over the phone. Once we created this e-mail account, we pre-authorized the customer

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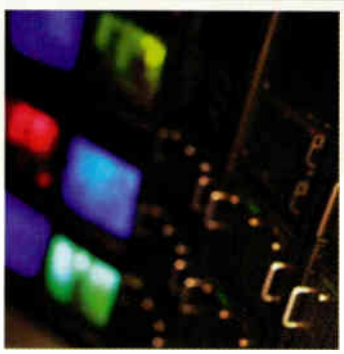

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Reader Service Number 62

to use MediaOne Internet service. The e-mail username and password allowed the customer to access the service from home once he or she had completed cabling and computer configuration.

The local coordinator confirmed this step before the customer left the service site. Additionally, the Tier 1 person recommended the customer do some general measuring in the home before coming to pick up the kit. The general measuring allowed MediaOne to provide the customer with lengths of wire most suitable to the dwelling, offering any length of wire needed to proceed.

Customers involved in the self-installation field study were comfortable opening their PCs to install the network interface card.

RF installation

During the actual installation, the customer simply followed instructions contained in the kits and connected the preterminated wire lengths as instructed. Our goal with the RF installation documentation was to have the customer make "home-runs" from where the cable entered the premises (demarcation point was the ground block) to the room where the cable modem would be located. (See Figure 2 on page 92).

By making these cable runs and following additional instructions, the dwelling would be capable of both one-way and two-way cable modem service. At the demarc, the customer rerouted the wire leading to dwelling's video distribution system (some kind of splitter) through either a directional coupler or a two-way splitter depending on signal strength. (See Figure 3 on page 92.)

The customer then connected the splitter/coupler to the home-run lead from the cable modem and a high-pass filter connected to the remaining receptacle. (See Figure 4 on page 92.)

The other side of the filter was connected to the video distribution system. (See Figure 5 on page 92.) Traps and amps can be placed between the filter and the video distribution system if needed to block premium channels or boost signal.

Note: The benefits of high-pass filters can be overshadowed by problems they cause for self-service. A filter anywhere between the cable modem and the broadband plant can terminate high-speed data service. It also can prevent self-service installs if it's out of the customer's reach (at the pole).

Our results

We closed the self-install test program after 83 participants had completed the process and become regular paying high-speed data customers. Of the 83 customers, only one couldn't activate the service, but this person proceeded through the fail-safes and later became a regular high-speed data customer.

Surprisingly, the ease of the RF installation portion of the self-install ranked very close to that of configuring the personal computer (PC). Our customers had the

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Mark Swanson successfully completed his own cable modem installation using procedures developed by MediaOne's Minnesota system.

most problems with cable modem and browser configuration.

A majority of the test participants completed the installation within two hours. While slightly more than half of the participants experienced technical difficulties during the installation, less than a third of those had to contact technical support.

The top reasons for choosing self-installation were fast activation (no waiting for MediaOne to install the service) and cost savings. Installation was free, and we gave participants $10 off service for the first three months.

Participants in the test were highly involved in computers. A self-assessment of skills revealed that participants were quite comfortable with opening a PC, installing a computer expansion card, and installing/configuring software.

Test participants generally owned more than one PC, with at least a Pentium processor in the newest one, and worked in the PC industry. All participants were male, but education and age varied.

Survey conclusions

It is likely that the positive experience with self-installation of MediaOne Internet service was directly related to the capability of the people completing the self-installation.

We used advanced authorization to set up the customer's account prior to the self-install. This pre-activated Internet account enabled the service to be immediately used once the customer completed cabling and CPE configuration. Field tests proved this was an effective method of leveraging existing practices to expand the number of ways to install high-speed data customers. ➤

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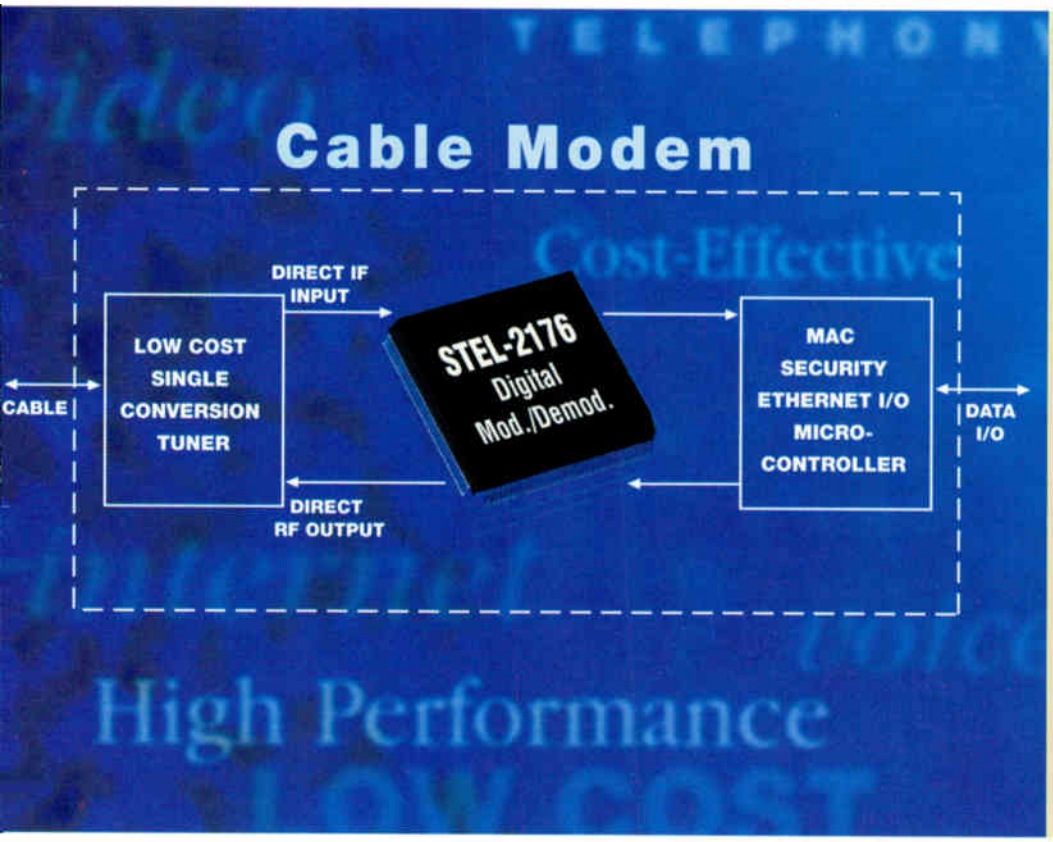

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Call center representative Bill Wilhite prescreens customers to make sure they have the technical skills to complete the cable modem installation.

True "no-truck" high-speed data installs are possible in a variety of cases depending on the skill of the customer and the type of dwelling. For example, an apartment can be one of the easiest wiring jobs and one that a majority of customers can accomplish. Likewise, a customer with technician-equivalent skills often prefers to do the install himself.

Self-install is viable and has a bright future. Currently, about 5 percent of all installs could be self-installs. Selection of self-install candidates is a key to being successful. Asking the right questions to ensure customer is comfortable is worth the time taken.

Remaining challenges

For average, below average and beginning computer users, high-speed data installation represents a significant challenge. Although the process is being simplified, some underestimated and unresolved issues remain:

Software, or lack thereof: A common misconception is that high-speed data service is as easy to install as other dialup Internet service providers. Up to a point, this is true. MSOs provide a network rather than a dialup connection. Dialup connections have been around for years and have several tried-and-true install applications for a dialup Internet service provider (ISP) to configure a customer for service.

However, no tried-and-true applications exist for network cards, which are the basis for MSO installs. Instead, MSOs must manually configure this hardware, which reduces the number of individuals who possess the skills for self-activation.

Developing a network configuration application for high-speed data installs would take at least a year and would need to keep up with current network technologies and drivers. In other words, network installs will be more difficult than dialup installs in the short term because of changes in network cards, drivers and networking technologies. Such network installation tools must be created.

In-house wiring: Most rooms used for home computing already have telephone jacks, but they lack cable TV outlets. Thus, outlets must be added, or cabling must be routed in from elsewhere in the dwelling. Until in-house wiring in new construction supports cable TV, high-speed data and telephony, installing high-speed data will be more complex than activating dialup services.

Universal hardware support: High-speed data also lacks hardware support. Because more than 90 percent of PCs lack a factory-installed network card, the install must provide it and sometimes software to activate it. Unfortunately, the average homeowner is uncomfortable opening a PC and installing additional hardware. Also, aspiring cable modem customers must prequalify their PCs because not all computers can handle additional hardware (slot or IRQ deficiency).

The hardware support problem cannot be solved in the short term. Based on an average three-year ownership of a PC before upgrading, only three years after all

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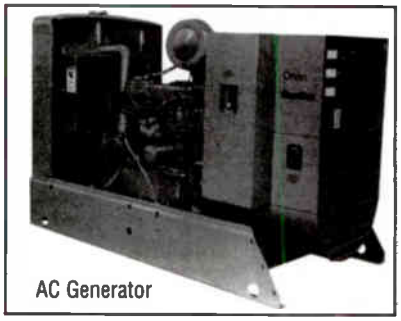

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PCs come standard with a built-in network card, universal serial bus (USB) or IEEE 1394 bus will this problem dwindle.

Billing issues: Activating cable modems is fairly easy. The hard part of self-activation is interfacing with a billing system. The success of a self-service installation program depends on how well it performs the necessary checks and balances to qualify a customer financially and interfaces with the MSO's billing system. A vendor-independent application interface (API) is needed for billing systems. Without this, complete self-activation (no MSO intervention) is not possible. A phased approach is necessary to reach some level of self-activation.

"A customer with technician-equivalent skills often prefers to do the install himself."

Yet, it's worth it

A self-install option enables additional installs without increasing field technicians' workloads. Techs can concentrate on things that actually need their attention, rather than performing installs for people who can (and prefer to) do it themselves.

MSOs must streamline existing install options and continue to expand into new areas. Because the base of customers who qualify for self-install is limited, the best way to add high-speed data customers is to provide many different ways for them to get activated. That is, MSOs must cater installation options to the skills and needs of their customers. CT

This piece is adapted and reprinted with permission from the 1999 National Cable Television Association Technical Papers.

Bruce Bahlmann is senior systems engineer for MediaOne Interactive Services group in Roseville, Minn. He may be reached at via phone at (651) 634-3246 or via e-mail at bbahlmann@mediaone.com.

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[Maintenance]

THE Build

Don't Forget to Do the Dishes

Keep Your Antennas Trouble-Free This Winter

By John Bisset

What do a bottle of car wax, a wrench, some dum-dum and a permanent marker pen have in common? They are tools of the trade when it comes to getting your satellite dishes ready for winter. Before the really bad weather hits, take some maintenance steps to ensure reliable performance through next spring.

Let's begin out in the dish field, or what some folks call the "ant farm." If your dishes are mounted in a grassy field, has it been mowed? Are all weeds and saplings removed from around the dish mounts? Undergrowth provides dandy shelter for insects, birds and rodents. If allowed to grow and tangle with the mounts, the vines will hold moisture and promote rusting.

If a stockade fence surrounds your dishes, you can easily forget what's going on inside the stockade. While inspecting the fencing, go inside and look around. Take a can of hornet spray—not only for your own protection, but also to spray areas common to bee and yellowjacket nesting. These areas include the gate area, overhangs and the feedhorn. Bugs just love such areas. While you're looking for hornets, make sure the entry cap on your feedhorn is secured. If the entry cap is missing, be sure to replace it.

Dealing with snow and ice

If you're not prepared, this winter's snow and ice can play havoc with your satellite dishes. Just getting to them in winter conditions can be a challenge. Locating your dishes in a gravel field or on asphalt means you'll have an easier time gaining access to them if you need to fix or check something when a winter storm strikes. At the very least, providing stepping stones or a shoveled access path will make it easier to remove snow and ice from the dish.

So what about this snow and ice removal? Electric and gas-fired de-icers are the most effective but most expensive option; fabric dish covers also work well. A less expensive method is to polish the dish using auto wax. Applying the wax using a foam mop mounted to an extension arm works best. The idea is to polish the inner parabola of the dish with a thin film of car wax. The liquid wax works better than paste. When ice and snow start to build up in the dish, the waxed surface will permit easy removal with a broom or squeegee.

Now is a good time to assemble your snow removal tools, before winter strikes with a vengeance. Visit your local paint supply store to get an extendable pole or extension arm, which you can then use to apply the wax. Later, you can outfit the pole with a squeegee or broom for snow removal.

Snow and ice removal is a good job for entry-level technicians paying their "dues." However, be sure that they are given some instruction as to the physics of how the dish works. Banging on the front or back of a dish may ruin the parabola. Letting too much snow accumulate in the dish can distort the lower lip.

Make sure they understand that snow and ice removal is a "patient" job—brawn is not needed. Help them understand that ice formations left to sit in a dish can permanently damage it. When inclement

weather strikes, make sure you assign someone to regular dish inspections and ice removal. Make it a part of their job description, so they understand the importance of keeping the dish clean.

Inspect cable entry points

As you inspect your flock of dishes, pay close attention to cable entries. Plugging the holes around these entry conduits with dum-dum or foam sealant will help to minimize problems stemming from moisture and insect intrusion. Sealing the entry into the building is just as important. You can use expanding foam sealant to both support a dual conduit run and also keep the elements outside, where they belong.

A pedestal mounted at the base of the dish makes for convenient cable runs back into the building. Check that pedestals are clean inside and locked.

While inspecting the mount, make sure ground wires are secure and bolts and nuts are tight. On fixed dishes, this is a good time to mark the dish with the permanent marker. When you know you have the dish properly peaked, draw a vertical line down the mount shaft. Because the line on the pole will align with the line on the mount shaft, if the dish shifts because of wind or vandalism, your technicians will be able to move it back into proper alignment quickly.

Above: An open feed horn invites trouble.

Left: Locate dishes in a gravel covered field for easier maintenance.

With your wrench, firmly tighten mounting bolts, inspecting for loose or missing hardware. Make sure that all the panels are properly aligned. Winter winds can deform dishes when mounting hardware is loose or missing. Replace rusted hardware now so that you won't have to hacksaw through a rusted bolt when it's 20° outside.

Watch for nesting animals

On Cassegrain dishes, inspect the back of the dish and the feedhorn tube for nesting animals. Squirrels especially like the security these structures provide, and they just happen to have a natural tendency to chew on cables, which can make your life a nightmare. Do what you can to seal these areas.

I recently noticed the problem of nesting animals on a 9.3-meter dish that was modified for multi-feed. The multiple cable runs inside the feedhorn tube made an excellent support structure for a squirrel's nest.

Keep an eye on pressures

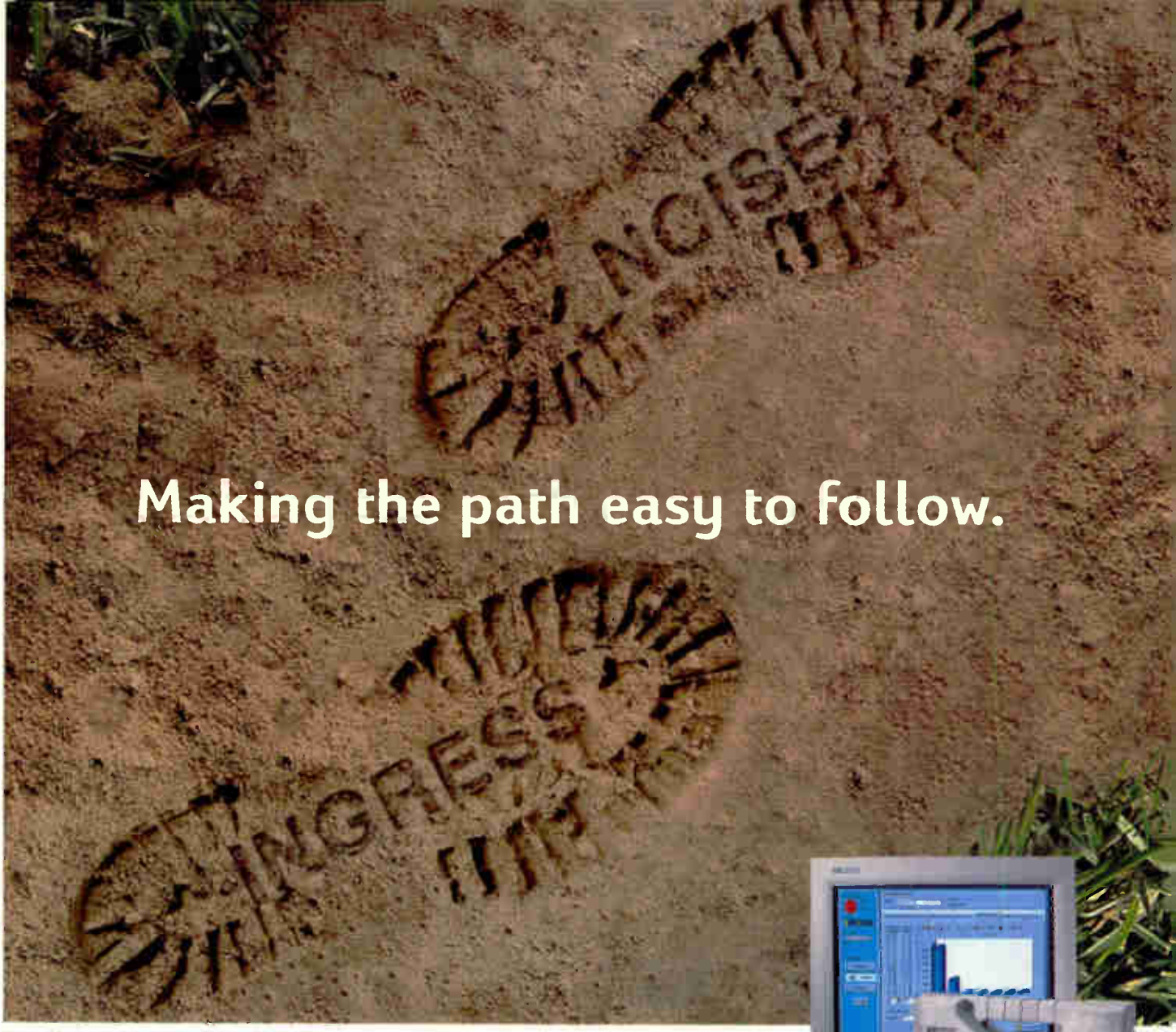
While the weather still is tolerable, it's also a good time to check cable and feedhorn pressurization equipment. If you use desiccant crystals in a dehydrator, make sure fresh crystals are on hand. It's also important that the crystal condition be checked regularly. Moisture-laden crystals defeat the purpose of the dehydrator. ➤

The Bottom Line

Prevent Dish Failure

Some simple maintenance tips can keep your satellite dishes in top shape. Assign these tasks to one of your technicians to prevent customer complaints if your dishes fail:

- **Check the grounds**: If your dishes are mounted in a grassy field, make sure it's been mowed and that weeds have been cleared from around the dish mounts.
- **Prepare for snow**: Dishes located in a gravel field or on asphalt provide better access in snowy weather. If you can't afford commercial de-icers or fabric dish covers, apply a thin coat of liquid car wax to the front surface of the dish. This will make it easier to use a broom or squeegee to remove any built-up snow.
- **Inspect cable entry points**: Plug any holes in entry conduits with dum-dum or foam sealant. This will minimize problems because of moisture and insect intrusion. If you use pedestals at the base of your dish, make sure they are clean inside and locked.
- **Watch for nesting animals**: Inspect the back of the dish and the feedhorn tube for nesting animals. Squirrels like the security of these structures, and their natural tendency to chew on cables can make your life a nightmare.
- **Deploy static protection**: Dry snowfall and strong winds can cause static discharges. If your lines are not protected by some sort of surge suppression, make that a priority. Be sure to have replacement fuses on hand for your power supplies.



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Reader Service Number 72

Above: Static discharges are dealt with using devices such as this Polyphaser®.

Right: Inspect open enclosures to be sure that no animals are nesting in them.

technician can ascertain if the system is working properly.

Static protection

Although lightning is only occasionally associated with winter weather, dry snowfall and strong winds can cause potentially damaging static discharges. If your lines are not protected by some sort of surge suppression equipment, be sure to make that a priority.

Also, be sure to have replacement fuses on hand for your power supplies. I've Velcroed a small fuse box on the back of receivers, just so a supply of fresh fuses is readily available. This ensures that the

Larger air dryers need periodic inspection, too. Sticking pressure switches can cause the dryer to run frequently and unnecessarily, resulting in premature failure of the compressor. By labeling gauges, pilot indictors and fuses, you'll ensure that even the most entry-level

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Reader Service Number 74

To avoid having critters take up residence in your dishes, keep the field mowed.

right amperage fuse is used when the mad rush is on to get the receiver working.

If you do lose your power supply, there is a quick fix for temporary operation. The test points on some Scientific-Atlanta receivers can be used to back-feed DC voltage from a working power supply to a receiver that's lost its power supply. Of course, be sure to unplug the AC line from the "dead" power supply before adding the jumpers. There's enough capacity in the S-A supply to keep both receivers working until proper repairs can be made. For other makes, verify with the manufacturer that this type of temporary fix can be done without overloading the power supply.

We've all had those temporary "permanent" fixes to deal with. And while we're on the subject of AC for your receivers, if you make a temporary AC feed with an extension cord, be sure to use nylon cable supports and drywall screws to prevent the cable from accidentally pulling from the socket. Loop the cord near the top of the plug so you can easily pull the plug in the event of an emergency. Check local electrical codes before using extension cords in this manner because it may be prohibited.

By following these simple maintenance tips, you can rest assured that the pigeons won't be coming home to roost in your dishes! TB

John Bisset is a district sales manager for Harris Broadcast and can be reached via e-mail at jbisset@harris.com.

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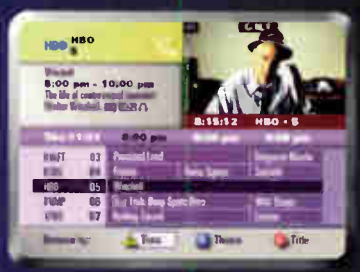

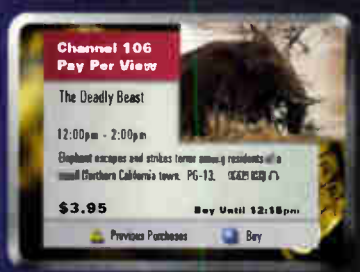

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Reader Service Number 78

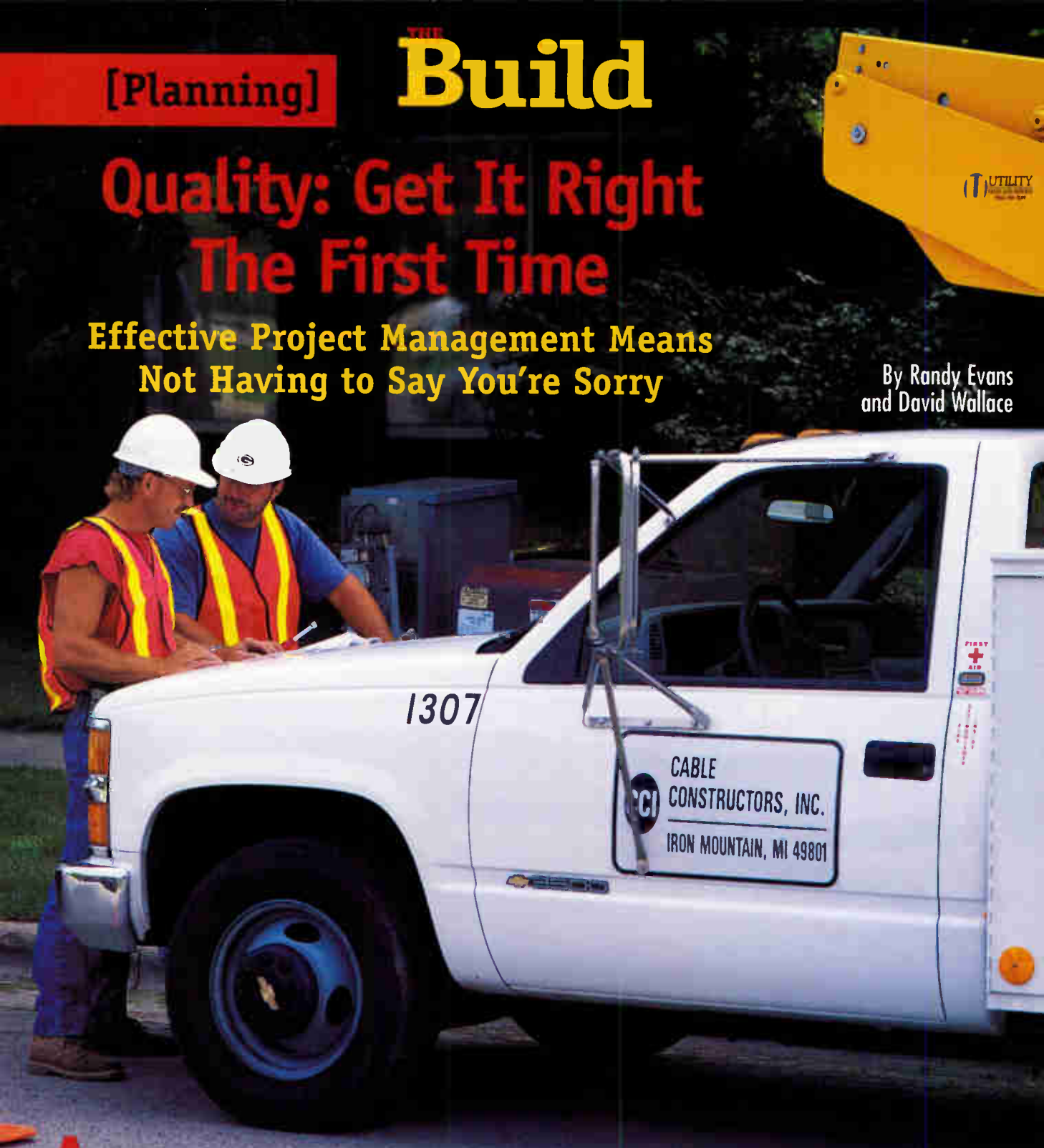
[Planning]

The Build

Quality: Get It Right The First Time

Effective Project Management Means Not Having to Say You're Sorry

By Randy Evans and David Wallace



Anyone who's ever built or fixed something knows the saying, "There's never time to do it right, but there's always time to do it over." Doing it over is fine if you're fixing a lawn mower, but it's considerably less fine when the job at hand involves miles of cable plant. It pays to plan for quality up front.

In rebuilds and upgrades today, a critical component of total quality management (TQM) is providing a structured management process to ensure that all customers are satisfied with the materials and services provided. Quality must be designed, engineered and defined in the overall process long before the project starts. (See project process chart on page 112). Reducing deficiencies means that fewer resources go to inspecting, repairing, replacing or doing work over again. Thus, proper planning directly improves quality and productivity.

Plan schedules in advance

A strategic component of TQM is work scheduling. Resource allocation by the multiple systems operator (MSO), utilities

Total Quality Management Tactics

As you implement the total quality management philosophy into your upgrade process, be sure to keep the following tips in mind.

- The desired quality level starts with the customer and works backward to the operator.
- Quality planning defines the quality metrics. This provides the structured process for internal and external customers.
- Quality objectives must be attainable. Keep goals simple, visible and easily understood.
- Goals must be specific to each task associated with all processes.
- Quality assurance maintains the quality control (QC) process from the quality planning phase.
- Reporting from the quality assurance phase improves quality.
- Failure analysis reports deficiencies for continuing improvement.

and owners of multiple dwelling units (MDUs) is critical to timely completion of a rebuild. Early in the process, all parties must define quality and schedule requirements. Partnering, involving all parties prior to the definition and development of design quality criteria, will reduce costs from design and schedule changes after the rebuild process has started.

Mergers can derail quality

We all hear this familiar comment: "My company was sold, and I don't know what the new company will expect of me." How does employee churn effect quality?

Rapid changes in the cable industry have disrupted standard quality definition practices. "Merger mania" and shrinking middle management staffs have created a vacuum in planning, QC and cost reporting.

Successful projects involve numerous interdependent resources. Because of high turnover in project management personnel, quality definition increasingly occurs during and after contract negotiations instead of up front, where it belongs. As a result, MSO and contractor requirements are not integrated, and costs escalate.

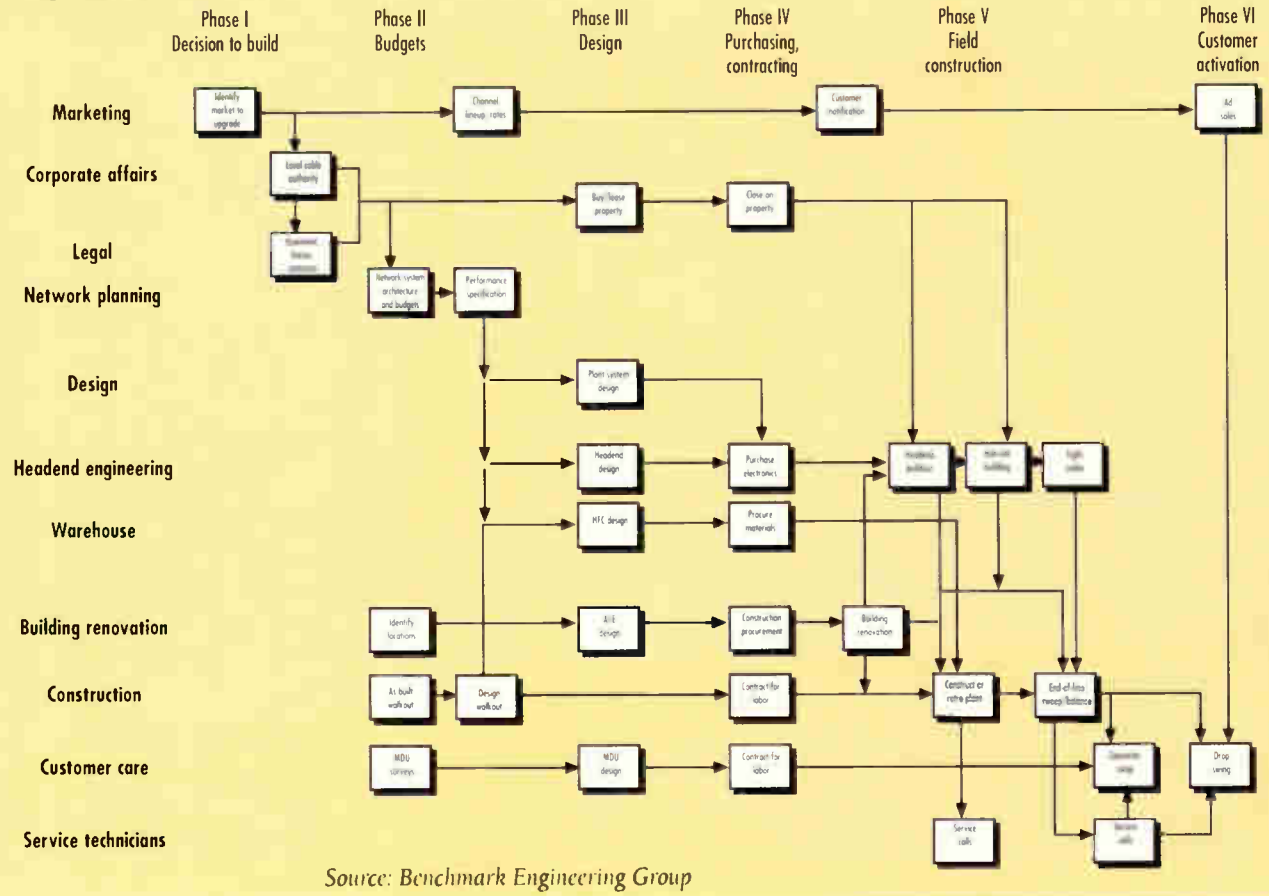
Downsizing, merging and employee turnover all have reduced the probability that corporate culture will automatically produce proper quality definitions. Despite this, the MSO stills needs to define quality objectives. Establishing the quality benchmark becomes even more critical as completion times shorten, material lead times lengthen and engineering resources dwindle.

Team integration and Partnering

The control process is a partnership between the cable operator, all suppliers and the general contractor. This flow defines:

- Communications, transmittal forms, approvals and so on
- Design, bill of materials (BOM), material releases
- Reports, variances for budget, schedule and so on
- Acceptance, QC, daily reports, testing, invoices
- Verification of capabilities and understanding by all trades personnel on the construction process ➤

Upgrade process model



Source: Benchmark Engineering Group

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Developing integrated commitments for all contracted parties prior to the approval of materials and contracts reduces project startup costs for training, lost time for approvals, defines the flow of materials for the duration of the project, and reduces the cost of project administration.

Integration and partnering in the field include the relationships between MSO field QC, engineering documents and the rebuild contractor. This process includes defining working field relationships, their reporting requirements and the approval processes. All parties must understand that the time required for each item is critical to the working relationship.

An example of timing agreements would be a jointly developed material issue schedule for nodes, which commits the MSO to deliver complete material packages: all the electronics, taps, passives, hardline, connectors and so on needed to build the node. The contractor in turn must provide sufficient advance notice for materials. Overall integrated planning should have a total material node package sequence so that the right materials are delivered at the right time in relation to the project's progress.

The material suppliers, MSO and contractor need to agree upon the material flow requirement in conjunction with the build rate schedule. Any change in material lead times or BOM changes affects the timing of everything that follows, so any

The Bottom Line

Maintain Quality In a Tough Environment

As rebuild and upgrade activities shift into overdrive, maintaining quality control (QC) can be difficult. A critical component of total quality management (TQM) is providing a structured management process to ensure that all customers are satisfied with the materials and services to be provided.

Quality must be designed, engineered and defined long before the project starts. Reducing deficiencies means that fewer resources are employed inspecting, repairing, replacing or doing work over. If you improve quality by reducing deficiencies, fewer resources are required, and quality and productivity improve.

A strategic component of TQM is work scheduling. Resource allocation by the multiple systems operator (MSO), the utilities and owners of multiple dwelling units (MDUs) is critical to the timely completion of a rebuild. Early in process, all parties must define quality and schedule requirements.

To streamline your rebuild activities, consider using outsourced personnel. Outsourced project managers can spend 100 percent of their time on your project, and are off the payroll as soon as the project is complete.

scheduling changes require adjustments to the rest of the schedule to keep materials deliveries in sync with the actual progress of the project. These relationships need to be written into the rebuild construction procedures manual, with the sequences and schedules attached, to serve as the basis for communication, reporting and conflict resolution on the project.

Total cost analysis

"Total cost" is the sum of all costs, regardless of which department or firm incurs them. The integrated team approach often can prevent errors early. If work is not completed according to the process, a total cost analysis can be applied to the cause of the work holdup. The mechanism for this analysis ought to be predetermined and could include labor costs and lost opportunity for profit. All parties need to sign on and be accountable.

Don't forget PR

Public relations (PR) for an MSO include relationships with employees, utilities, customers, governmental units and franchise areas. Predefining the sequence for work, scheduling, scope of MDU upgrades, timing of upgrades, and requirements for rights of way and pole make-ready simplifies the project for everyone. The sequence for notification of work, and knowing who will handle customer calls, also should be written into the rebuild procedure manuals. Early discussions will greatly reduce PR worries.

Outsourcing options

MSOs are starting to follow other industries by using outsourced planners and project managers. It represents a low-cost and responsive alternative to hiring long-term, mid-level employees to plan and implement rebuilds.

Outsourced personnel can be charged to capital on the project, rather than operations. Such personnel have a single focus, can devote 100 percent of their time to a project, and are off the payroll as soon as the project is complete.

The industry takes two approaches to outsourcing: one for original planning and staff integration, and another for project management, often provided by the contractor. Planners working for the MSO ensure that the MSO's quality and timing needs are met. Because they are part of the corporate team, they provide cross-training for operations personnel who will run the system when the project is done.

The point

Early involvement of all parties will reduce the cost and increase the quality of any project. If everyone involved knows what the other parties need, all can work together to satisfy those needs. TB

Randy Evans is a rebuild project manager for Harron Communications. He may be reached via e-mail at revans@harron.com. David Wallace, P.E., MBA, is president of Benchmark Engineering Group Inc. He may be reached via e-mail at david.wallace@benchmark-usa.com.

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Reader Service Number 84

DANGER

WARNING

1999 SCTE Safety Survey Results

By Earl Bennett

The results are in for the Society of Cable Telecommunications Engineers' annual Safety Survey. SCTE's Safety Committee conducted the study to see what safety issues are hot within the cable telecommunications industry.

The typical company represented in the survey:

- Has a formal safety policy
- Provides formal safety training and certification
- Holds monthly safety meetings
- Experiences most of its lost time from slip-and-trip accidents
- Wants to know more about fall protection equipment and its use (Interestingly, no respondent listed falls from heights as the leading cause of lost time.)
- Believes SCTE provides and promotes good safety information
- Rates safety as being of the highest importance to its operation

Findings and meanings

This year's results indicate encouraging trends for our industry. It appears that most companies within the telecommunications industry see the value of safety. Most realize that basic safety training is important, and they also are looking for information on some of the new safety concerns that we will face as we build the telecommunications networks of the future.

The survey's mix of 60 respondents was fairly diverse, with the majority being management-level employees, which produced interesting results. More than half of the respondents believe in communicating the safety message through safety meetings, taking disciplinary action and conducting additional training. However, many employees or companies still do not see the benefit of communicating the safety message.

The responses also indicate that our industry needs to continue to "raise the bar" for safe work practices within all of the companies represented. Our greatest challenge continues to be putting safety on the same line of importance as meeting marketplace demands, introducing new technologies and expanding our industry's future profitability. Further, the SCTE needs to stay on the cutting edge of our industry by providing information about changes in safe work practices and procedures.

Lastly, the industry needs more safety professionals to get involved in making safe work procedures and practices known to our growing industry. Thus, *Communications Technology* extends an invitation to other safety professionals to write articles on some of the hot topics listed. By working together, we can do more than just provide access to the "information superhighway;" we can also make it a safe driving experience for all concerned.

The raw data

1) Does your company/location have a formal disciplinary policy for violating basic safe work practices?
Yes: 32
No: 18
Do not know: 10

2) Does your company/location provide safety training for any of the following safety issues?
Ladder Usage: 46
Personal protective equipment: 45
Pole climbing: 38
Aerial lift operation: 38
Fall protection: 37
Working near power: 35
Electrical: 32
Supervisory safety training: 24
Ergonomics: 18
Forklift usage: 16
Respiratory protection: 11

3) How often does your company/location have documented safety meetings? ➤

Bi-weekly: 3
Weekly: 11
Bi-monthly: 7
Monthly: 26
Do not hold safety meetings: 13

4) Are your employees formally trained (documented or certificate-issued) on a new safety process when a potentially dangerous operation is introduced into the workplace?
Yes: 31
No: 16
Do not know: 13

5) Are your employees certified (attended a formal class, taken a written exam, practical testing) in, or is there any formal documentation collected for, any of the following safe work procedures?
Defensive driving: 33
Pole climbing: 31
Personal protective equipment usage: 29
First aid and CPR: 29
Fall protection: 26
Aerial lift truck safety: 24
Electrical safety: 21
Hazard communication: 20
Forklift operation and safety: 19
Working near power: 18
Bloodborne pathogens: 9

6) Which of the following accident types cause the most lost time at your operation?
Slips and trips: 33
Vehicle: 18
Falls from heights: 15
Material handling: 11
Forklift: 0
Electrical: 0
Do not know: 9

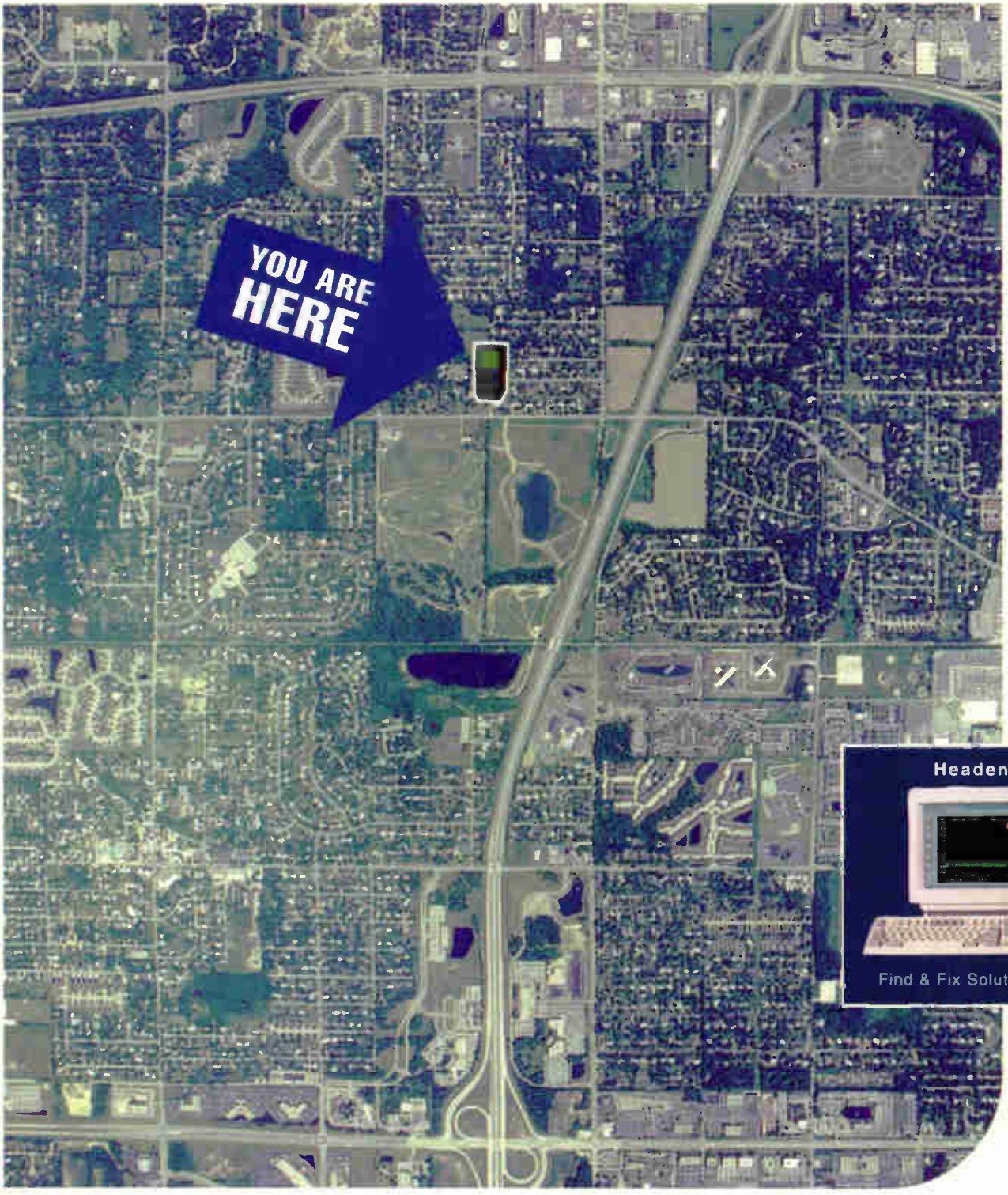
7) Of the following choices, on which safety topic would you like to see an article in *CT*?
Fall protection equipment and usage: 39
90 V practices: 36
Types of voltage detectors used: 26
Respiratory protection practices: 16
Tree trimming policy: 14
Forklift training practices: 6
Other: 10
(Performing safety training sessions, airborne contamination issues, manholes/vaults, unsafe customer and/or public contact, road hazard, customer premise safety, trenching operations, adverse weather ladder use, working around primary and secondary power lines, fiber-optic safety)

8) Do you believe the SCTE is doing enough to provide pertinent information about safe work practices within our industry?
Yes: 31
No: 16
Do not know: 13

9) Which of the following best describes your position within your operation?
Operations manager/director: 10
Technician: 9
Operations supervisor: 8
Line technician: 5
Plant manager: 5
Engineer: 4
System safety coordinator: 3
Safety manager: 3
Safety director: 2
Trainer: 2
Training manager: 2
Training director: 2
Installer: 1
Other: 6

10) On a scale of one to 10, with 10 being the highest importance and one being the lowest, rate how important safety is to your company's mission.
10 (Highest importance): 22
9: 5
8: 6
7 (Some importance): 11
6: 1
5: 3
4 (Less importance): 1
3: 6
2: 2
1 (Lowest importance): 3 TB

Earl Bennett is chairman of the SCTE Safety Committee's Research Committee and director of training, safety and quality at ViaSource Communications, Inc. He may be reached via e-mail at EarlDrum@aol.com.



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Detecting Signal Leakage, Part 4

This month's installment continues a series on detecting signal leakage in the drop system. The material is adapted from a lesson in NCTI's Installer Technician Course. © NCTI.

Isolating leakage at wall plates, jumpers and CPE

Once you verify that the entire outside portion of the drop system has no signal leakage, attention can then shift inside the customer premises. With the leakage isolated to individual outlets, check all possible signal leakage sources inside the customer premises.

Possible signal leakage sources include cable wall plates (Figure 1), coaxial jumpers (Figures 2 and 3) used to configure customer premises equipment (CPE), and in some cases, the CPE itself. Replace any suspect coaxial jumpers. In some instances, poorly shielded CPE may emit RF signals in the critical signal leakage bandwidths.

To isolate CPE-caused signal leakage, remove the coaxial jumper from the RF output on the suspected set-top terminal or videocassette recorder (VCR), then attach a 75-ohm terminator to the RF output port. Monitor the area with a signal leakage detector. If the suspected signal leakage is coming from CPE owned by the customer, follow your system's procedures and policy for informing the customer and making any recommendations for repairs.

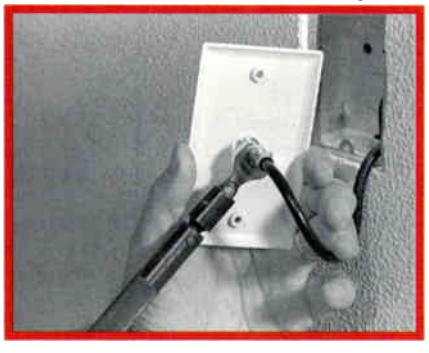

Figure 1: Checking out connections at the wall plate

Figure 2: Checking connections at TV set or video cassette recorder

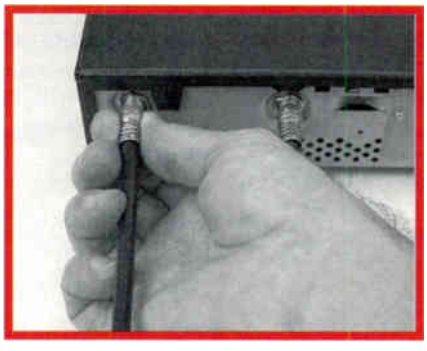

Figure 3: Checking connections at set-top terminal

Repairing signal leakage

Once you isolate the cause of the signal leakage, repair the problem using the logical choice suggested by the leakage source:

1) If the leakage is caused by damaged coaxial cable, replace or repair the cable (as your system policy dictates).
2) If connectors are the problem, tighten or replace the connectors as necessary.
3) If a passive device is causing the leakage, replace the passive device.
4) With active devices, ensure the amplifier housing is providing a good environmental and RF interference (RFI) seal.
5) If CPE provided by the cable system is the cause, replace the device.
6) If customer-owned CPE is the cause, follow your system's policies for informing the customer and removing the device from use.

Signal Leakage Sources and Possible Repairs

Signal leakage source	Possible repair
Coaxial jumpers	Repair, replace
F-connectors	Tighten, replace
Passive devices	Replace
Active devices	Check housing, seals
System CPE	Replace
Customer-owned CPE	Remove CPE and inform customer

Following these simple steps will work with single-source leaks. Signal leakage that results from multiple sources may require making several or all of these repairs. The table above outlines signal leakage sources and their possible repair. TB

Next month's installment will cover recognizing false alarms when trying to isolate the cause of signal leakage in the drop system.

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1441 Sunshine Lane
Lexington, KY 40505
(606) 299-6288; Fax (606) 299-6653
www.MooreDP.com
mooredp.com
Gia Phelps and Bob DeMuth
Moore diversified Products is a manufacturer of metal and plastic products that store, organize and protect fiber optic and coaxial cable in outside plant construction.
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Elyria, OH 44035
(440) 366-6966; Fax (440) 366-6802
www.multilinkinc.com/multilinkinc
mulink@ix.netcom.com
Steve Kaplan
Multilink is a leading manufacturer of cable television supplies. Multilink manufactures plastic enclosures, metal enclosures, and splice closures as well as fiber optic, and telecommunications products.
Reader Service #21, 100

nCUBE
1172 Century Drive, Suite 200
Louisville, CO 80027
(303) 218-9100; Fax (303) 218-9112
www.ncube.com
Ron Barracks (303) 218-9100
rbarracks@ncube.com
nCUBE leads the pack in development of Video-on-Demand. Our reliable, scalable, and economical video server has demonstrated 5,120 - 3 Mbps simultaneous VOD streams in a single server, performed more than 100 VOD installations (all with VCR functionality), and has deployed systems in virtually every broadband environment. nCUBE's SkyConnect digital ad insertion product-line is based upon the reliable and scalable Compaq 64-bit AlphaServer.
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www.nortelnetworks.com
cheatham@nortelnetworks.com
Brian White, VP of Sales
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CATV@rldrake.com
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Toshiba offers MCNS modems and MCNS gateway solutions, plant and market analysis, system design, installation and maintenance. Toshiba's systems are operating in 6 major markets actively servicing over 12,000 cable subscribers.
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www.wwgsolutions.com
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- 19. Public/Private Utility
- 20. System Contractor
- 21. Hardware/Component Manufacturer/Dist.
- 18. Other (please specify)

B. Check the TITLE that most CLOSELY matches your current position: (check only one):

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- 32. President
- 33. Owner
- 34. Vice President
- 35. Partner

Operations Management
- 36. General Manager
- 37. Business Manager
- 38. Operations Manager
- 39. Product Manager
- 40. Purchasing Manager

Engineering Management
- 41. Engineering VP
- 42. Engineering Manager
- 43. Director of Engineering
- 44. Engineering Supervisor
- 45. Corporate Engineer
- 46. Senior Engineer
- 47. Regional Engineer
- 48. Divisional Engineer
- 49. Plant Manager
- 50. Installation Manager
- 51. Network Manager
- 52. Construction Manager
- 53. Field Services Manager
- 54. Technical Manager Engineering
- 55. Engineer
- 56. Headend Engineer
- 57. Const. Engineer
- 58. OSP Engineer Technical
- 59. Headend Technician
- 60. Line Technician
- 61. Bench Technician
- 62. Sweep Technician
- 63. Other Technical Title (Please specify)

Installation
- 64. Installer
- 65. CSR
- 66. Other Installation Title (Please specify)

E. In the next 12 months, what cable equipment do you plan to buy?
- 35. Amplifiers
- 36. Antennas
- 37. CATV Passive Equipment including Coaxial Cable
- 38. Cable Tools
- 39. CAD Software, Mapping
- 41. Compression/Digital Equip.
- 43. Connectors/Splitters
- 45. Headend Equipment
- 46. Transmission/Switching Equipment
- 47. Networking Equipment
- 48. Vaults/Pedestals
- 49. MMDS Transmission Equipment
- 51. Receivers and Modulators
- 52. Cable Modems
- 53. Subscriber/Addressable Security Equipment/ Converters/Remotes
- 54. Telephone/PCS Equipment
- 55. Power Supply. (Batteries, etc.)
- 56. Video Servers

F. What is your annual cable equipment expenditure?
- 57. up to $50,000
- 58. $50,001 to $100,000
- 59. $100,001 to $250,000
- 60. over $250,000

G. In the next 12 months, what fiber-optic equipment do you plan to buy?
- 61. Fiber-Optic Amplifiers
- 62. Fiber-Optic Connectors
- 63. Fiber-Optic Couplers/Splitters
- 64. Fiber-Optic Splicers
- 66. Fiber-Optic Patchcords/Pigtails
- 68. Fiber-Optic Cable

H. What is your annual fiber-optic equipment expenditure?
- 70. up to $50,000
- 71. $50,001 to $100,000
- 72. $100,001 to $250,000
- 73. over $250,000

I. In the next 12 months, what cable test & measurement services do you plan to buy?
- 74. Audio Test Equipment
- 75. Cable Fault Locators
- 76. Fiber Optics Test Equipment
- 77. Leakage Detection
- 78. OTDRs
- 79. Power Meters
- 80. Signal Level Meters
- 81. Spectrum Analyzers
- 82. Status Monitoring
- 83. TDRs

J. What is your annual cable test and measurement expenditure?
- 84. up to $50,000
- 85. $50,001 to $100,000
- 86. $100,001 to $250,000
- 87. over $250,000

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002740

L. What is your annual cable services expenditure?
- 91. up to $50,000
- 92. $50,001 to $100,000
- 93. $100,001 to $250,000
- 94. over $250,000

M. Do you plan to rebuild/upgrade your system in:
- 95. 1 year
- 96. more than 2 years

N. How many miles of plant are you upgrading/rebuilding?
- 97. up to 10 miles
- 98. 11-30 miles
- 99. 31 miles or more

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20. System Contractor
21. Hardware/Component Manufacturer/Dist.
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54. Technical Manager Engineering
55. Engineer
56. Headend Engineer
57. Const. Engineer
58. OSP Engineer Technical
59. Headend Technician
60. Line Technician
61. Bench Technician
62. Sweep Technician
63. Other Technical Title (Please specify)

Installation
64. Installer
65. CSR
66. Other Installation Title (Please specify)

E. In the next 12 months, what cable equipment do you plan to buy?
35. Amplifiers
36. Antennas
37. CATV Passive Equipment including Coaxial Cable
38. Cable Tools
39. CAD Software, Mapping
41. Compression/Digital Equip.
43. Connectors/Splitters
45. Headend Equipment
46. Transmission/Switching Equipment
47. Networking Equipment
48. Vaults/Pedestals
49. MMDS Transmission Equipment
51. Receivers and Modulators
52. Cable Modems
53. Subscriber/Addressable Security Equipment/ Converters/Remotes
54. Telephone/PCS Equipment
55. Power Supply. (Batteries, etc.)
56. Video Servers

F. What is your annual cable equipment expenditure?
57. up to $50,000
58. $50,001 to $100,000
59. $100,001 to $250,000
60. over $250,000

G. In the next 12 months, what fiber-optic equipment do you plan to buy?
61. Fiber-Optic Amplifiers
62. Fiber-Optic Connectors
63. Fiber-Optic Couplers/Splitters
64. Fiber-Optic Splicers
66. Fiber-Optic Patchcords/Pigtails
68. Fiber-Optic Cable

H. What is your annual fiber-optic equipment expenditure?
70. up to $50,000
71. $50,001 to $100,000
72. $100,001 to $250,000
73. over $250,000

I. In the next 12 months, what cable test & measurement services do you plan to buy?
74. Audio Test Equipment
75. Cable Fault Locators
76. Fiber Optics Test Equipment
77. Leakage Detection
78. OTDRs
79. Power Meters
80. Signal Level Meters
81. Spectrum Analyzers
82. Status Monitoring
83. TDRs

J. What is your annual cable test and measurement expenditure?
84. up to $50,000
85. $50,001 to $100,000
86. $100,001 to $250,000
87. over $250,000

Circle Numbers for Free Information

1	25	49	73	97	121	145	169	193	217	241	265	289
2	26	50	74	98	122	146	170	194	218	242	266	290
3	27	51	75	99	123	147	171	195	219	243	267	291
4	28	52	76	100	124	148	172	196	220	244	268	292
5	29	53	77	101	125	149	173	197	221	245	269	293
6	30	54	78	102	126	150	174	198	222	246	270	294
7	31	55	79	103	127	151	175	199	223	247	271	295
8	32	56	80	104	128	152	176	200	224	248	272	296
9	33	57	81	105	129	153	177	201	225	249	273	927
10	34	58	82	106	130	154	178	202	226	250	274	298
11	35	59	83	107	131	155	179	203	227	251	275	299
12	36	60	84	108	132	156	180	204	228	252	276	300
13	37	61	85	109	133	157	181	205	229	253	277	301
14	38	62	86	110	134	158	182	206	230	254	278	302
15	39	63	87	111	135	159	183	207	231	255	279	303
16	40	64	88	112	136	160	184	208	232	256	280	304
17	41	65	89	113	137	161	185	209	233	257	281	305
18	42	66	90	114	138	162	186	210	234	258	282	306
19	43	67	91	115	139	163	187	211	235	259	283	307
20	44	68	92	116	140	164	188	212	236	260	284	308
21	45	69	93	117	141	165	189	213	237	261	285	309
22	46	70	94	118	142	166	190	214	238	262	286	310
23	47	71	95	119	143	167	191	125	239	263	287	311
24	48	72	96	120	144	168	192	216	240	264	288	312

002740

L. What is your annual cable services expenditure?
91. up to $50,000
92. $50,001 to $100,000
93. $100,001 to $250,000
94. over $250,000

M. Do you plan to rebuild/upgrade your system in:
95. 1 year
96. more than 2 years

N. How many miles of plant are you upgrading/rebuilding?
97. up to 10 miles
98. 11-30 miles
99. 31 miles or more

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PS Form 3526, September 1995 (See Instructions on Reverse)

13. Publication Title: Communications Technology	14. Issue Date for Circulation Data Below: September 1999	
15. Extent and Nature of Circulation	Average No. Copies Each Issue During Preceding 12 Months	Actual No. Copies of Single Issue Published Nearest to Filing Date
a. Total Number of Copies (Net Press run)	30,501	29,719
b. Paid and/or Requested Circulation (1) Sales Through Dealers and Carriers, Street Vendors, and Counter Sales (Not Mailed)	-	-
(2) Paid and/or Requested Mail Subscriptions (Include advertiser's proof copies and exchange copies)	27,523	27,525
c. Total Paid and/or Requested Circulation (Sum of 15b (1) and 15b (2)) X	27,523	27,525
d. Free Distribution by Mail (Samples, complimentary, and other free)	1,753	1,672
e. Free Distribution Outside the Mail (Carriers or other means)	1,204	500
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h. Copies not Distributed (1) Office Use, Leftovers, Spoiled	21	22
(2) Returns from News Agents	-	-
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16. Publication of Statement of Ownership
☒ Publication required. Will be printed in the November issue of this publication.
☐ Publication not required.

17. Signature and Title of Editor, Publisher, Business Manager, or Owner: David Shaw, Senior Vice President — Date: 9/25/99

I certify that all information furnished on this form is true and complete. I understand that anyone who furnishes false or misleading information on this form or who omits material or information requested on the form may be subject to criminal sanctions (including fines and imprisonment) and/or civil sanctions (including multiple damages and civil penalties).

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3. Be sure to furnish all circulation information called for in item 15. Free circulation must be shown in items 15d, e, and f.
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6. Item 17 must be signed.

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PS Form 3526, September 1995 (Reverse)

CALENDAR

November

9: Cascade Range Society of Cable Telecommunications Engineers Chapter technical seminar, Holiday Inn, Wilsonville, Ore. Contact Chris Johnson at (503) 245-0603, Johnson.Chris@tci.com or visit members.aol.com/cascte/cascte/.

10-11: OSP Expo '99, Fort Worth Convention Center, Fort Worth, Texas. Call (847) 639-2200.

10-11: Telcordia Technologies Telecommunications Overview seminar, Piscataway, N.J. Call (800) 832-2463.

11: Penn-Ohio SCTE Chapter technical seminar and testing session, Sheraton North Inn, Pittsburgh. Topic: "SBE/CATV." Broadband Communications Technician/Engineer (BCT/E) certification examinations to be administered. Contact Marianne McClain at (412) 531-5710, mmclain@baker-installations.com or visit www.scte.org/penn-ohio/.

11: SCTE Satellite Tele-Seminar Program, Galaxy 1R, Transponder 14, 2:30-3:30 p.m. ET. Topic: "Excellence Through Customer Service." Contact SCTE headquarters, Janene Martin, at (610) 363-6888, ext. 226, or jmartin@scte.org.

13: Cascade Range SCTE Chapter testing session, TCI, Salem, Mass. BCT/E certification examinations to be administered. Contact Chris Johnson at (503) 245-0603, Johnson.Chris@tci.com or visit members.aol.com/cascte/cascte/.

16-19: Color Imaging Conference, SunBurst Resort, Scottsdale, Ariz. Call (703) 642-9090.

17: Chesapeake SCTE Chapter vendor show, Comfort Inn, Bowie, Md. Contact Frank Cruse at (703) 358-2768 or cfrank@erols.com.

17: Old Dominion SCTE Chapter technical seminar, Richmond Hotel and Conference Center, Richmond, Va. Topic: "Services that Utilize Return Path." Contact Maggie Fitzgerald at (540) 248-3400, mmteam@aol.com or visit members.aol.com/mmteam/ODC.HTM.

17: Piedmont SCTE Chapter technical seminar, Hickory, N.C. Topics: "EAS Update, Operational Support System Overview, ATM Operational Overview and Annual Membership Meeting." Contact Mark Eagle at (919) 829-2630, mark.eagle@twcable.com or visit www.ols.net/scte/index.htm.

17: Southern California SCTE Chapter technical seminar. Contact Charles Harper at (310) 647-6645 or charper@mediaone.com.

17-19: Wavetek Wandel Goltermann's "Forward and Return Sweep and Balance" course, Indianapolis. Call (800) 851-1202.

18: Greater Chicago SCTE Chapter technical seminar, Holiday Inn, Willowbrook, Ill. Topic: "HDTV Update and Digital Set-Tops." Contact Jim Beletti at (630) 871-2727, beletti.jim@tci.com or visit www.scte.org/chicago/gccscte.htm.

18: New Jersey SCTE Chapter technical seminar, Kenilworth Inn, Kenilworth, N.J. Topic: "HFC Network Operations." Contact Earl Bennett at (908) 665-0133.

18: Rocky Mountain SCTE Chapter technical seminar. Topic: "Cable Modems and Data Over Cable Service Interface Specification (DOCSIS)" with Joe Pitcock and Ken Holtz. Contact Gary Morton at (303) 797-9393 or visit www.scte.org/rockymtn/home.htm.

23-24: Appalachian Mid-Atlantic SCTE Chapter testing session, TV Cable of Carlisle, Carlisle, Pa. Installer, BCT/E, Service Technician and Telephony examinations to be administered. Contact Loarn Arthur at (717) 263-5541. CT

Planning Ahead

Dec. 14-17: Western Cable Show, Los Angeles. Call (510) 428-2225 or go to www.cct-assn.org.

Jan. 11-13: SCTE Conference on Emerging Technologies 2000, Anaheim, Calif. Call (610) 363-6888.

Feb. 23-25: 40th Anniversary Texas Show, San Antonio Convention Center, San Antonio. Call (512) 474-2082.

March 12-15: Eastern Cable Show, Atlanta. Call (404) 255-1608.

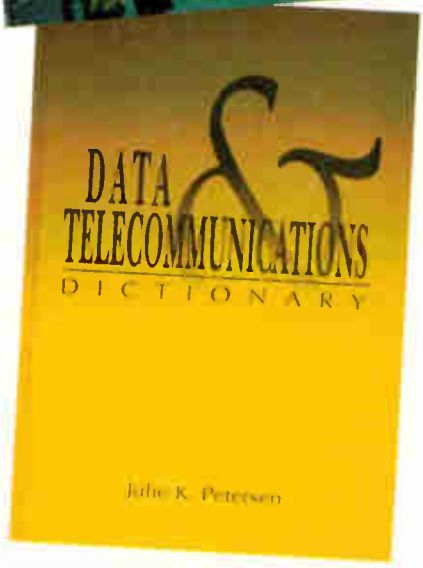
BOOKSHELF

The following is a listing of some of the resources currently available by mail order through the Society of Cable Telecommunications Engineers. The prices listed are for SCTE members only. Nonmembers can contact the Society for additional pricing information.

- *Data and Telecommunications Dictionary* by Julie K. Petersen—The *Data and Telecommunications Dictionary* provides technical information in an easy-to-understand format. Users will appreciate this guide through the labyrinth of terminology, procedures, tools and applications. This book documents significant information in a substantial and relevant manner and is generously illustrated with charts, diagrams and timelines to enhance its readability and provide the reader with greater accuracy and historical content. Hardcover, 820 pages. Order TR-43, $50.
- *DTV: The Revolution in Digital Video* by Jerry Whitaker—The 1999 edition is filled with more than 600 pages of tables, equations and illustrations about the latest technology—digital video. Using concept-clarifying examples, schematics and mathematics, author Jerry Whitaker covers topics from applications (professional, medical, military, industrial, telecommunications, computer design), to video and audio compres-

sion, receiver systems and display devices, and video measurement techniques. It's a comprehensive guide for the transition to a fully digital facility. Hardcover, 619 pages. Order TR-44, $62.

- *Graphic Symbols for Cable Television Template*—This is a template of graphic symbols currently used in cable system drawings and diagrams. It was jointly developed by the SCTE and National Cable Television Association and expanded to include optical splice locations, coaxial cable, optical hub sites and fiber symbols. Order DT-6, $10.
- *Cable-Tec Expo '99 Proceedings Manual*—The *Proceedings Manual* contains information about dense wave division multiplexing (DWDM), Internet protocol (IP), Data Over Cable Service Interface Specification (DOCSIS), forward and reverse plant maintenance, upgrading networks, integrating digital broadband systems, digital video deployment, OpenCable and cable telephony. Order PM-21, $30.



Note: The videotapes are in color and available in the NTSC 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. 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.

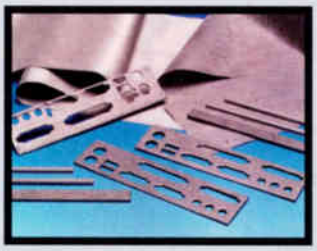
To order: All orders must be prepaid. Shipping and handling costs are included in the continental U.S. All prices are in U.S. dollars. SCTE accepts MasterCard and Visa. To qualify for SCTE member prices, a valid SCTE identification number is required, or a complete membership application with dues payment must accompany your order. Orders without full and proper payment will be returned. Send orders to: SCTE, 140 Philips Rd., Exton, PA 19341-1318 or fax with credit card information to (610) 363-5898.

Character Generator

Video Data Systems' videoGizmo character generator is designed for multiple dwelling units (MDUs) where building management wishes to send information to all tenants.

The system features a single-region display for editing, a crawl feature that can overlay pages, transition pages, colorful backgrounds, a scheduling system for all screens, a logo system to create independent graphics, Windows-based editing and communications software, and options for sound and weather enhancements.

Reader Service #302



EMI Gaskets

Advanced Performance Materials has introduced a tin-over-copper formulation to the Flectron metallized fabric used in its Foam-Tite electromagnetic interference (EMI) shielding gaskets.

According to the company, the tin finishing layer's galvanic properties will reduce the new gaskets' potential for corrosiveness when in contact with the various metals used to build electronics enclosures.

The company also hopes that tin could prove to be less allergenic than other materials commonly used in fabric-over-foam EMI gaskets.

Reader Service #311

Leakage Detection Upgrade

Wavetek Wandel Goltermann has upgraded the "find and fix" mode in its CLI-1450 and CLI-1750 signal leakage meters. All new units include the upgrade, and owners of older devices can download it free at www.wwgsolutions.com.

The version 6.0 firmware is designed to make the instruments up to 10 times faster to use, bringing leak level variation response times up to 10 per second. The find and fix mode is intended primarily for hunting leaks on foot in drop-to-home or in-home applications and features a numeric readout and auto-scale graph.

The firmware upgrade also supports Spanish and French for either domestic or international use.

Reader Service #312

VOD Upgrade

The Vivid Technology VOD (video-on-demand) System, with new hardware and Release 3.0 of its software, now supports an expanded system architecture with several new features.

The system is designed to output 192 streams from a single 6-rack unit-high module that puts out 256-QAM (quadrature amplitude modulation) signals directly and is scalable to 20,000 streams.

The system also provides interfaces to a variety of third-party billing systems. The service can be programmed to periodically deliver the billing information, format it for a given third-party system, and transmit the information to the billing system.

The new software supports content propagation to multiple headends from the Vivid Library Server. The automated system can schedule and automatically initiate content distribution and allows content management to "learn and adjust" so that more popular titles are as close to subscribers as possible.

Reader Service #309

Termination Test Set

Jensen Tools' PocketToner 2 cable termination device has one port for the cable lead and an audible sounder for tone verification. It also contains a light-emitting diode (LED) indicator for DC shorts, cable splitters and other self-grounding devices.

Technicians can test circuit integrity in new or installed cable runs with an audible tone that identifies the line carrying the signal. The female thread connection is designed for quick removal of male F-connectors and easy change-out of multiple adapters.

Reader Service #305

Fiber Breakout Kits

Berk-Tek has introduced indoor/outdoor buffer tube breakout kits designed for field termination of any loose-tube fiber cable with field-installable connectors.

According to the company, the kits require no additional hardware beyond that needed to terminate fibers in tight-buffered cable and need no epoxy. The kits feature a 900 µm break-out assembly that is color-coded to match the fiber color scheme. Outdoor kits have clear Teflon 900 µm color-coded tubes to aid in fiber identification, and the furcation unit is available for any standard-sized buffer tube.

The assembly comes in 6- and 12-fiber kits with tube lengths of 24 or 36 inches.

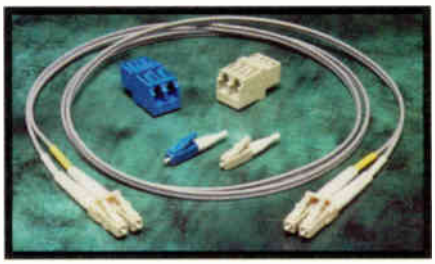
Reader Service #303

Hinged Raceway Covers

Panduit now has available hinged covers for its PAN-NET cable management systems. The hinged covers are designed to facilitate easier access to cables than fixed covers provide.

The covers open in either direction and can be ordered with optional horizontal or vertical cable management panels. The panels also can be retrofit to systems that already are installed in the field.

Reader Service #306



LC Terminators

Seiko Instruments has added LC Termination Solutions to its line of fiber-optic products. The small LC connectors are designed to double the number of devices that can be installed in a single panel. The connectors are available in single- and multimode versions with various connectors (Simplex/Duplex), adapters and patchcords.

The connectors feature an insertion loss rate as low as <0.10 dB for single-mode and <0.20 dB for multimode fiber. Typical return loss is -55 dB for single-mode UPC and -65 dB for single-mode APC connector styles.

The connectors are compatible with SYSTIMAX and ExchangeMAX components and meet EIA/TIA 568A, FOCIS 10 and IEC 11801 specifications.

Reader Service #304

Internet Gateway

UMAX Technologies' UGate-3000 offers small- to medium-sized firms a secure firewall and Internet gateway for up to 253 simultaneous users on a cable modem or asymmetrical digital subscriber line (ADSL) local area network (LAN).

UGate-3000's Network Address Translation (NAT) mechanism is intended to reduce an always-on broadband LAN's exposure to incursions by hackers.

It features four-port, 10/100BaseT Ethernet as well as a Dynamic DNS (domain name service). An embedded hypertext transfer protocol (HTTP) server allows configuration for authorized access using any standard Web browser over the Internet or local workstation on the LAN.

The UGate-3000 also can be connected to a router to provide LAN access by a satellite office with no need to reconfigure the local network. It also can act as a dynamic host configuration protocol (DHCP) server.

Reader Service #301

A/D Converter

Analog Devices' AD9432 is designed as a monolithic sampling 12-bit, 105 megasample per second analog-to-digital converter (A/D). It has an on-chip reference and track-and-hold circuit that delivers an 80-dB spurious free dynamic range (SFDR) up to the Nyquist frequency and draws 850 mW.

The encoder input supports either differential or single-ended signals, and the digital output features a separate output power supply pin to allow for interfacing with 3.3 V logic. It operates from a single 5 V supply and uses a switched capacitor architecture. A self-contained calibration feedback loop sequentially optimizes capacitor values to within one part in 2,048.

Reader Service #307

Fiber Depolarizer

Alliance Fiber Optic Products has released its All Fiber Single-mode Depolarizer, a passive broadband 1,550 nm device designed to reduce the polarization of even narrowband light sources.

The device is intended for use in measurement systems where polarization needs to be eliminated. Linewidth sources less than 0.1 nm can be depolarized, and a 980 nm version also is available for Erbium-doped fiber amplifier (EDFA) applications.

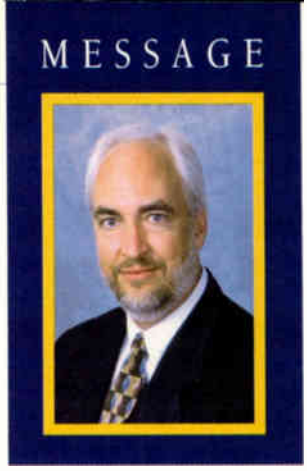
Reader Service #308

SONET Multiplexer

Fujitsu Network Communications' Flash150 ADX synchronous optical network (SONET) add/drop multiplexer is designed to combine traditional optical carrier (OC)-3 and OC-12 operation with bandwidth grooming and data transport capabilities. The combination is intended to help cost-effectively provide multiple services over a single fiber-optic network.

The system features a hybrid time division multiplexing/asynchronous transfer mode (TDM/ATM) architecture and any-port-to-any-port connectivity. It also integrates the functions of a small ATM edge switch, ATM service access mux, and such data interfaces as 10/100BaseT Ethernet in one unit to save on the space and costs associated with numerous pieces of equipment.

Reader Service #310



By Alan Babcock

Customer Service Essentials

A recent J.D. Power and Associates cable/satellite TV customer satisfaction study indicated that cable TV companies fall short of direct broadcast satellite (DBS) providers in delivering good customer service. According to the study, DirecTV and the Dish Network enjoy a comfortable lead over the nearest cable TV company.

Many will argue that the survey doesn't really compare apples to apples. While that's certainly true up to a point, these results still contain enough validity to warrant concern and, more importantly, action on our part. The survey response that showed dramatic differences between the two industries dealt with price and value. The DBS services scored very high in two key factors—cost of service and program offerings.

DBS has a cost advantage in that it doesn't require a fleet of trucks or bunches of technicians to install and maintain service. DBS customers largely are responsible for their own installation and maintenance unless they pay a company to provide that service.

Perceptions of service

Service is a different story. The study indicates that cable technicians and installers can dramatically impact the perceived value of cable service relative to DBS. Cable companies must spend more time and energy developing the customer service skills needed by installers and technicians who face customers in person.

These face-to-face skills differ from those needed to answer customers' questions over the phone. The technician must be able to present a professional and competent image of the company in appearance, communications and, of course, job task competence.

And professionalism doesn't stop with the contact at the customer's home. The technical employee must always be conscious of his behavior when driving, dining in a public restaurant or walking into a store. Technicians are the only face of cable that our customers usually see, so they need to make a good impression.

Until now, there really hasn't been a customer training program designed just for technical employees. The Society of Cable Telecommunications Engineers is developing such a program specifically to satisfy this need.

Program essentials

Customer Service Essentials for Today's Technical Personnel is designed to provide the customer service training necessary for technicians and installers. The program includes four parts: "Professionalism," "Customer Relations," "Product Knowledge" and "Partner Selling."

"Professionalism" presents the foundation for understanding what a professional is. It then gives students the insight and tools to help them understand how to present a professional image to customers and the general public.

"Customer Relations" helps to develop skills that can be used to build rapport with the customer. It isn't enough just to answer customers' questions or repair their service. This part helps technicians find ways to connect with customers on a more personal and professional level. After an exchange between technician and customer, both can feel good about the interaction. Both should feel that they have done their best to work toward a productive outcome; even if the root problem wasn't completely resolved, it should be clear that the best effort was made to resolve the issue.

"Product Knowledge" provides a framework for the technician to learn pertinent information about the types and prices of services, packages and programs offered by the cable company. It also provides an understanding of services offered by competitors such as DBS. Our technicians and installers have an excellent opportunity to talk directly with customers about how cable services stack up against those of the competition.

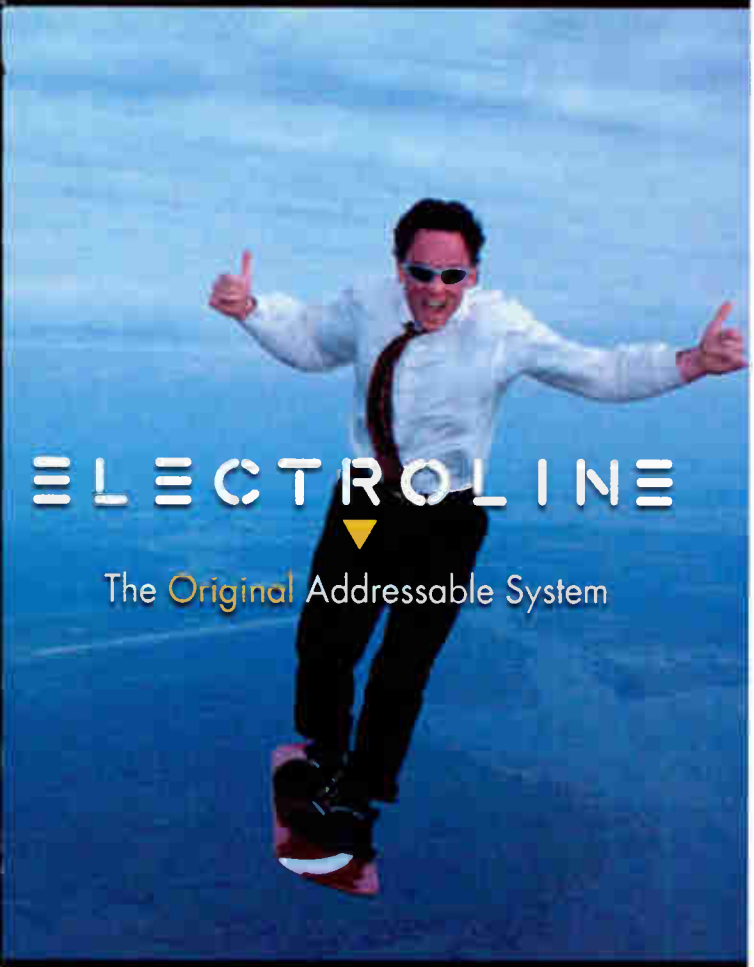
Finally, "Partner Selling" presents concepts and tools for providing value-added service. The focus is not on selling services, but partnering with the customer to identify the appropriate products and services that best fit the customer's wants and needs. In many cases, the technician will confirm that the customer has the best mix of products and services.

BST certification

Customer Service Essentials also is an integral part of the Broadband Service Technician (BST) certification program. Successful completion of this training will ensure that a BST candidate will perform well on the Customer Service exam. A student manual will be included for self-study, and a matching leader guide will provide the information for a trainer to present the material in a classroom.

Technicians and installers have a dramatic effect on the customer service perceptions of our customers. Our technical employees need the tools to help our customers realize that we do provide quality service at a competitive price. Technical competence alone isn't enough. We need to constantly convince customers of the value we provide. CT

Alan Babcock is director of training development for the Society of Cable Telecommunications Engineers. He can be reached via e-mail at ababcock@scte.org.



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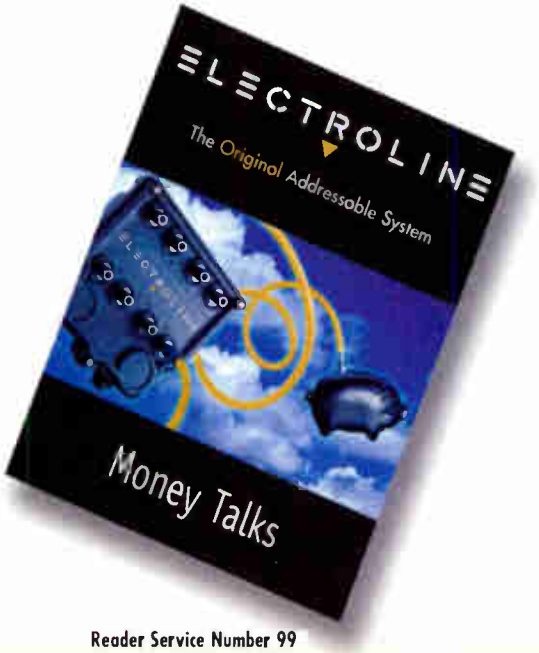

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TOLL FREE • NORTH AMERICA (800) 461-3344
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