OCTOBER 1996

CED

COMMUNICATIONS ENGINEERING & DESIGN
THE PREMIER MAGAZINE OF BROADBAND COMMUNICATIONS

Network testing in a complex world

MediaOne's headend ◆ Project Agora ◆ Telephony challenges

SIEMENS
Stromberg-Carlson

CoAxiom™

It's More than just words

It's the solution for adding enhanced telephone services to the same coaxial cable that carries television programming. It's an essential building block for evolving today's telephone and Cable TV networks to fully integrated, multi-media services.

CoAxiom uses advanced spectrum management technology, enabling the cable to carry both upstream and downstream telephony channels at the same time that it's carrying video. A Customer Interface Unit, located at the residence or office, separates the channels, connecting twisted pairs to telephones and PCs, and connecting a cable to the television set. A Headend Interface Unit links the telephone channels, over industry standard interfaces, to the public switched network.

The telephone channels support all public network services, including ISDN for integrated voice and data.

CoAxiom is offered worldwide by a partnership of Siemens, Scientific-Atlanta, and Siemens Stromberg-Carlson. Together, we're offering practical solutions that are more than just words.

Siemens Stromberg-Carlson
900 Broken Sound Parkway
Boca Raton, FL 33487
(407) 955-6054 Visit us at:
http://www.ssc.siemens.com

GLOBAL VISION

DYNAMIC SOLUTIONS

Looking through your customers' walls

Within the past month, Time Warner officially kicked off its "Road Runner" high-speed on-line service, as did TCI/Comcast/Cox with their @Home service. Both, of course, offer data transfer and Internet access at speeds hundreds of times faster than the telcos can with conventional POTS modems. And both are providing continuous connections for a monthly flat fee.

With the launch of their own high-speed data services, the nation's largest cable system operators are plunging headlong into uncharted waters as they search for new revenue opportunities. But even the casual reader of this magazine will realize by the time he gets to the last page that there remains at least one, huge obstacle to realizing that dream–the cable drop and in-home wiring.

Estimates vary, but some observers suggest that upwards of 50 percent of the coaxial cable that's running in basements and through walls in the homes of customers is inadequate to facilitate digital video or data signals.

Even systems that have been recently rebuilt could be in for a rude awakening. While fiber has been added to the trunk and feeder portions of the plant, in-home wiring is rarely touched. There's never been any need to replace it, because even vintage coax can routinely pass scores of channels of analog video to multiple TV sets. But the digital world is much more uncertain–no one is quite sure if that old, unshielded coax can offer reliable service. And virtually no one has any test equipment to find out.

But the industry now has a golden opportunity to rectify the situation without it becoming a huge financial drain. But it's going to require an investment in time, training and test gear to make it work.

According to @Home and Roadrunner executives, cable systems will be charging upwards of $150 to install cable modems, Ethernet cards and related hardware and software. That fee should more than cover the cost of labor and materials (as long as the installer doesn't get involved in a massive software morass). Anything extra ought to be invested in high-quality coaxial cable and F-connectors, so that when the installer leaves the house after hooking up a cable modem, the system won't fail.

Early cable modem users will be a cable operator's best customer. Installers need to be instructed on how to do the install right–the first time. After all, customers only invite you in once; after that, you're there on more contentious grounds because something doesn't work.

For their part, the MSOs need to specify and install cable with enough shielding to protect the integrity of the signals from the harsh in-home RF environment. They need to develop policies that mandate drop testing before the installer leaves. Personnel should be encouraged to treat the home wiring and drops as systems that should rarely be cut into. In short, the drop needs to be recognized for what it is: just as valuable as the headend itself.

So, if you haven't already, consider the age of the cable that's in your subscribers' homes. Realize that many have probably purchased substandard cable as they wired their own additional outlets. If it can be called into question, *now* is the time to bite the bullet. Being proactive could cost you less, in the long run.

Roger J. Brown

Roger Brown
Editor

CED MAGAZINE

VP Group Publisher
William McGorry
Publisher
Robert C. Stuehrk, Rstuehrk@aol.com
Editor
Roger Brown, Rbrowner@aol.com
Managing Editor
Dana Cervenka
Associate Editor
Michael Lafferty, McLaffrt@aol.com
Contributing Editors
Leslie Ellis, Ellis299@aol.com
Fred Dawson

CONSULTING ENGINEERS
Chairman
Wendell H. Bailey, NCTA VP, Science and Technology

MEMBERS
Jim Chiddix, Chief Technology Officer, Time Warner Cable
Stephen D. Dukes, VP Technology, TCI Technology Ventures
David Fellows, Sr. VP, Engineering and Technology, Continental Cablevision
Tom Jokerst, Sr. VP, Engineering, Charter Communications
Earl Langenberg, Executive Director, Growth Division, US West Communications
Dave Large, Principal, Media Connections Group
Robert Luff, President & CEO, TV/COM International
Pete Smith, VP Engineering, Rifkin & Associates
Joe Van Loan, Consultant

Director of Sales & Marketing
Scott C. Snyder, SSnyderCED@aol.com
National Accounts Managers
Linda S. Sommer, Lssommer@aol.com
Michael Tangney
Classified Sales Manager
Tim Reeder; 800/866-0206
Assistant to the Publisher
Michelle Pazar
Production Manager
Johanna McGinnis
Art Director
Don Ruth
Assistant Art Director
Anney Grossberg

Address
600 S. Cherry St., Suite 400
Denver, CO 80222
303/393-7449; Fax 303/393-6654
Web site: http://www.cedmagazine.com

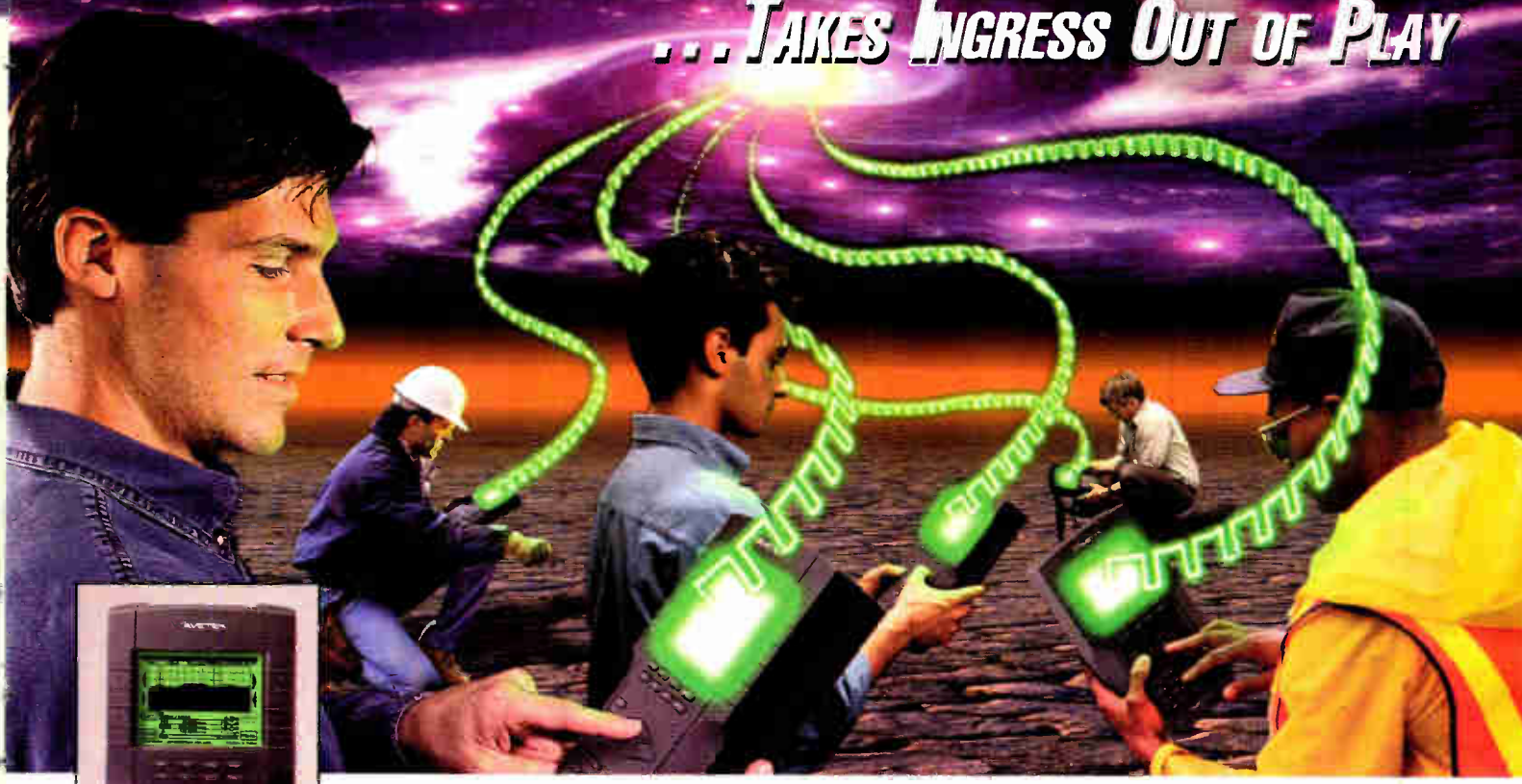
Circulation Director
Maria Gottlieb; (212) 887-8565
Associate Circulation Manager
Shawn Green; (212) 887-8564
Subscriber services
CED
P.O. Box 10728
Riverton, NJ 08076-0728
Telephone: 609/786-0501; Fax: 212/887-8493

CHILTON PUBLICATIONS
Leon C. Hufnagel Jr., President
Christopher M. Savine, Sr. VP Finance
Bill O'Brien, Sr. VP Communications Group

BPA INTERNATIONAL

THE TEAM TESTER...

...TAKES INGRESS OUT OF PLAY



Wavetek's Multi-User Stealth Reverse Sweep

Multi-User Capabilities... Get the latest in Wavetek sweep technology. With the multi-user capabilities of the Stealth Reverse Sweep System, your sweep technicians can simultaneously perform reverse sweeps and help eliminate the impact of ingress on the measurement.

More Powerful... Engineered for powerful performance, the Stealth Reverse Sweep has +50dBmV output to ensure measurement capability, even in high ingress and noise environments or with high-loss test points. Sweep techs can quickly and easily perform sweeps, identify problem areas, and troubleshoot with the handheld Stealth.

The Stealth is precision engineered to save time, simplify testing, reduce fatigue, and gain comprehensive results. No wonder the Stealth is preferred by technicians around the world.

Greater Performance... Only with the Wavetek Stealth do you enjoy precise measurements of forward and return path alignment and...

- Up to 10 simultaneous users
- 50dBmV output to help eliminate corruption from ingress
- In-service signal analyzer for C/N and hum
- Noise and ingress spectrum display
- Automated 24-hour testing capability
- High-resolution, easy-viewing LCD screens
- Rugged/water resistant hand-held field unit

Confidence... The Stealth Reverse Sweep System is just part of Wavetek's complete line of quality test and measurement equipment. We pioneered the SAM ... Sweepless Sweep ... and, Return Sweep. Each product delivers all the performance, precision, speed, and ease of use you demand — at a value you expect – from the leader. We are your signal meter specialists.

Power up for the interactive revolution with the Stealth Multi-User Reverse Sweep System. In the U.S. call,

1-800-622-5515

Wavetek...partners in productivity for over 35 years

WAVETEK

Worldwide Sales Offices

United Kingdom (44) 1603-404-824
France (33) 1-4746-6800
Germany (49) 89-996-410
Eastern Europe (43) 1-214-5110
United States (1) 317-788-9351
Southeast Asia (65) 356-2522
Asia Pacific (852) 2788-6221
China (86) 10-6500-2255
Japan (81) 427-57-3444

http://www.wavetek.com

Reader Service 2

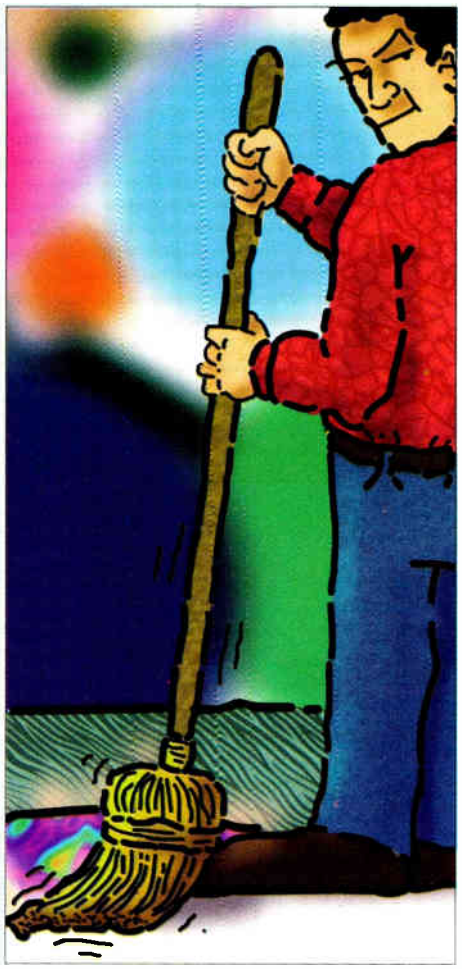


Illustration by Don Ruth

36 Preventing ingress in the upstream

By Kevin J. Oliver, Wavetek Corp.

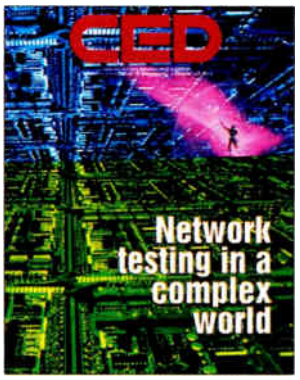
As they prepare to launch advanced, two-way services, cable operators are struggling to clean up the return path. One of the biggest hurdles to a tidy return seems to be ingress. This article details how to find and conquer ingress before it becomes a customer service nightmare.

SCTE®

CED magazine is recognized by the Society of Cable Telecommunications Engineers.

Contents

Features



About the Cover
Photo by Pete Turner, The Image Bank

 CED (USPS 330-510) (ISSN 1044-2871) is published monthly except twice in May by Chilton Publications, A Capital Cities/ABC Publishing Group, 825 7th Ave., New York, NY 10019. Volume 22, Number 11. U.S. domestic subscriptions are $54. Outside USA, subscriptions are $75 for surface delivery or $96 for air speed delivery, prepaid in U.S. funds drawn on a U.S. branch bank. Periodicals postage paid at New York, NY 10019 and additional mailing offices. CED is published on behalf of the cable television and broadband communications industries. POSTMASTER: Please send address changes to CED Circulation, P.O. Box 10728, Riverton, NJ 08076-0728. MEMBERS OF THE BPA. Canada Post International Publications Mail Product (Canadian distribution) Sales Agreement No. 649945. Printed in U.S.A.

Where's the satellite and broadband technology that bridges the gap between yesterday and tomorrow? Right here at Standard.

From our first frequency-agile receivers and modulators to the breakthrough innovations of the still-emerging Stratum series of advanced network modulation equipment, Standard has been in the forefront of headend technology, offering value, ease of use, space saving design and exceptional signal quality.

Need examples? How about our Agile Omni Broadcast series, very possibly the most acclaimed commercial satellite TV receivers of all time? Or our TVM series of modulators that revolutionized how MSOs regarded frequency-agile performance? Or our space-saving, cost-saving CSG-60 BTSC stereo generator? Or the CATV industry's top-selling IRD, the one-rack-high Agile IRD-II?

Standard will help you cope with the challenges of bandwidth expansion with our new TVM550 frequency agile modulator and a changing industry with advanced technologies like our remarkable Stratum Series of signal distribution products. Stratum can put 78 channels in a six-foot rack space, and give you all the status monitoring, redundancy and remote control you could ask for.

Year after year, Standard has continued a tradition of quality and innovation. And we aren't stopping now. To learn the latest about the right technology for right now, use that old tried and true technology at the bottom of this ad.

Give us a call.

The Right Technology for Right Now.

Standard Communications

SATELLITE & BROADBAND
PRODUCTS DIVISION

P.O. Box 92151 • Los Angeles, CA 90009-2151
310/532-5300 ext. 280 • Toll Free 800/745-2445
Fax: 800/722-2329 (Toll Free) • 310/532-0397 (CA & Int'l Only)

Canadian Address: 41 Industrial Pkwy S., Units 5 & 6
Aurora, Ontario Canada L4G-3Y5
905/841-7557 Main • Fax: 905/841-3693
Sales: 800/638-4741

All the technology you need.

Reader Service 3

Contents

Departments

Reader Services

Products

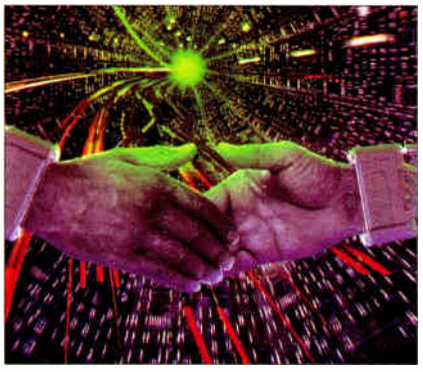


Photo by Uniphoto.

Columns

Is ingress making your return path a road to nowhere?

Ingress is the major roadblock to getting your return path up and running. Fortunately, there's the new HP CaLan Sweep/Ingress Analyzer. It's the only test gear that allows you to quickly and accurately troubleshoot your system, regardless of the presence of ingress.

When ingress corrupts reverse-path communication, the headend unit (HP CaLan 3010H) senses the problem instantly, and transfers the display of the ingress problem to the field unit (HP CaLan 3010R). That means your technicians can begin troubleshooting immediately.

Now you can troubleshoot your system at all times. No matter how much ingress is present.

And of course, the HP CaLan Sweep/Ingress Analyzer offers DigiSweep, the industry's fastest, non-interfering, digital-services compatible forward and reverse sweep. In fact, reverse sweep measurements can be performed in real-time — even with multiple users.

So don't let ingress slow you down. To find out how HP CaLan's Sweep/Ingress Analyzer can help you identify, troubleshoot, and eliminate your ingress problems, call **1-800-452-4844, Ext. 1748**. Or visit us at: http://www.hp.com/go/catv

Reader Service 5

HEWLETT® PACKARD

WAVETEK

Confidence Up a

Wavetek CATV

Comprehensive Solutions... For more than a quarter century, the Wavetek line of cable meters has been providing the *right* solutions for your system testing needs.

We worked our way down the line by pioneering the cable signal analysis meter (SAM 4040) and Stealth (non-interfering) Sweep technology. Plus, Wavetek added *portability* to the field engineers' vocabulary. Wavetek meters simplify testing, save time, and reduce fatigue.

Quality Performance... Each meter provides powerful performance designed around you. Whether you're a newcomer or an industry veteran, Wavetek equipment provides key advantages when it comes to size, weight, rugged design, and ease-of-use.

Wavetek technology fits right in your hand. Yet, there's no compromising on performance with precision measurements for maintenance, troubleshooting, and remote testing and logging.

nd Down the Line

Test Instruments

User Friendly... View a comprehensive collection of measurements on LCD spectrum displays that are easy to see even in bright sun and under temperature extremes. Plus, easy user interface and automated testing sequences makes operating Wavetek equipment a fast, one-man operation.

Confidence... Over the years, Wavetek has extended traditional boundaries to deliver better, more cost-effective testing solutions. As applications become increasingly complex, Wavetek equipment ensures that your system is operating properly. We build our line to keep your line working.

Wavetek Communications Test Solutions

Signal Analysis
Continuously Referenced System Sweep
Portable Reverse Sweep
Sweepless Sweep™
Leakage Detection
Portable Transmitters
Stealthware Data Analysis Software
Network Analyzer
Headend & Hub Monitoring Systems
LAN & WAN Testers
High Resolution & Portable OTDRs
Cellular & PCS Testers

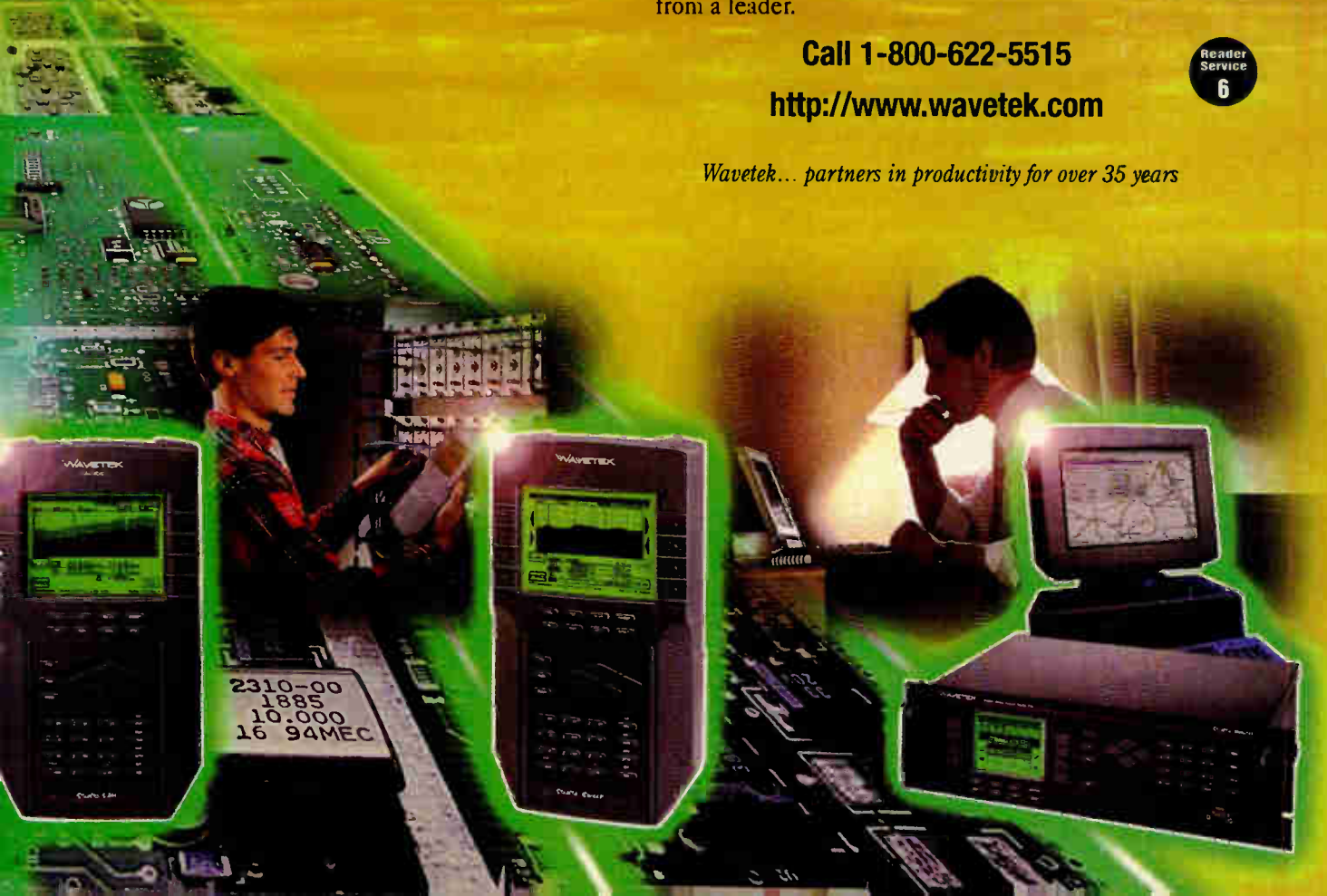
Wavetek test and measurement equipment delivers all the performance, speed, and ease of use you expect from a leader.

Call 1-800-622-5515

http://www.wavetek.com

Reader Service 6

Wavetek... partners in productivity for over 35 years



Bay Networks acquires LANcity for $59M; promises end-to-end solution

High-speed cable data modem pioneer LANcity was acquired by datacom giant Bay Networks last month in a $59 million deal that will give Bay an instant presence in the cable TV market with what it calls a complete end-to-end solution for transporting data from the Internet cloud to the end user.

Well-known LANcity founder and CEO Rouzbeh Yassini will join Bay as vice president and general manager of its cable access group, and will report directly to Bruce Sachs, executive vice president of Bay's Internet/Telecom Business Unit. In addition, all of LANcity's management team and employees are expected to be absorbed by Bay Networks.

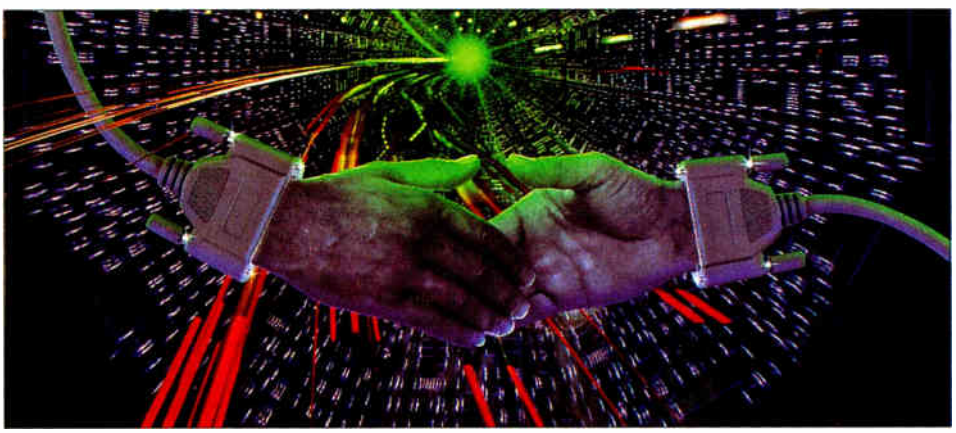


Photo by Uniphoto

LANcity and Bay have worked closely in a number of cable modem trials, demonstrations and roll-outs, and Bay was attracted to the deal because of LANcity's technical expertise and market leadership, said Sachs, who said he sees the marriage as a perfect fit. "This is one technology that gives Bay a leading position," said Sachs during a teleconference. "With our focus on providing equipment for edge access, this (acquisition) is consistent with our goal."

In fact, the two companies have been working together to market a combined solution since late in 1995 that consisted of LANcity's modems and Bay's networking equipment and network management software.

The acquisition gives LANcity immediate access to Bay's vast research, development, marketing and sales resources, something it needed to expand at the rate necessary to equip cable systems with modems that will soon be ordered.

Bay will begin immediate integration of the LANcity technology into its product line, with the goal of driving costs down while adding features and functions. The LANcity modem will be co-branded with the Bay Networks name and logo. "LANcity is the market leader," noted Sachs, who added that it is not a name Bay intends to abandon anytime soon.

LANcity products will be tightly knitted into Bay's popular data routers, Ethernet and ATM switches and other products. Yet both Yassini and Sachs said the system will be based on open standards and will be interoperable with hardware from other vendors–something that cable engineers have said is vitally important for them.

Yassini and Sachs said Bay plans to also build products for high-speed data based on xDSL and ISDN standards. "We think all those technologies are important," said Sachs, who said he views ADSL and cable modems as complementary products in the effort to connect the world at high speed. "You can look for future announcements in strategy soon," Sachs promised.

Broadcom offers single chip for modems

Cable operators seeking price relief on cable modems, currently priced at $500 and more, may see some downward price pressure as early as next year as the first wave of silicon integration starts.

A case in point is Broadcom Corp., a leading supplier of the modulation silicon used in digital home devices, which came out of the gate recently with a chipset designed for cable modems. Dubbed "QAMLink," the three-chip set will collapse to one chip next March, says Tim Lindenfelser, vice president of marketing for Broadcom. "It's obvious that standards and integration are needed to drive down costs, and it'll be the silicon manufacturers that make this happen," he says.

Already, modem manufacturers Motorola Inc., General Instrument Corp. and Hewlett-Packard Corp. are using the Broadcom solution. Scientific-Atlanta also plans to use the Broadcom chips as its cable modem strategy emerges, Lindenfelser says.

QAMLink, in its current, three-chip version, integrates all of the upstream and downstream physical layer modulation used in cable modems. The single-chip version will mesh in higher-level media access control (MAC) protocols as they are defined by the IEEE 802.14 standards body, says Rich Nelson, director of cable TV marketing for the vendor.

The chipset includes two versions of a downstream processor. Both handle 64- and 256-QAM modulation with forward error correction for signals traveling from the headend toward the cable modem, but one was designed to be compliant with the Digital Video Broadcast (DVB) standard.

GI, Motorola and S-A will use Broadcom's BCM3036 upstream burst modulator, designed to overcome reverse signal interference with frequency agility and optional QPSK or 16-QAM modulation.

Currently, 1,000-piece quantities are priced at about $70, while the upstream modulator is $40, Nelson says.

ADSL tests set; chips on horizon

Other Bell companies are planning to blunt the cable industry's high-speed data services by rolling out ADSL-based products. For example, GTE Corp. will test ADSL technologies in tandem with Microsoft Corp. The test already has about 40 Microsoft employees on its Redmond, Wash. campus connected, and will extend over the next six months to include the University of Washington and up to 60 local businesses.

The Redmond test augments a "proof of concept" trial conducted by GTE in the Irving, Texas area earlier this year. Several other trials will be introduced throughout the remainder of this year, says Flynn Nogueira, manager of the ADSL Program Office for GTE Telephone Operations. The company sees itself "in a position to begin deploying ADSL in selected

When You Talk Fiber, You're Speaking Our Language.

"Our fiber optic inventory means we're here to provide you with the products you need today with quality service and fast, accurate delivery."

Wendell Woody
Sprint North Supply
Executive Director,
Cable Television Sales

When you need to talk fiber, you need a distributor who knows the language. You need Sprint North Supply.

As the only national distributor whose first name is Sprint, our fiber experience has grown along with the nation's first and only 100% digital fiber optic network. So you can count on us for a full line of fiber-related products, including fiber optic cable, jumpers, pigtails, cabinets, splicing closures, panels, trays, vaults, tools, testing equipment and transmission products.

Our customer-focused sales consultants are as close as a toll-free phone call, to listen to your needs, provide a solution... and get it shipped out the door within 24 hours from one of our 11 strategically located distribution centers.

At Sprint North Supply, the language of fiber means fast, accurate delivery... pre-paid freight... and hassle-free exchanges. So call today, and let's talk fiber.

FREE FIBER OPTIC PRODUCTS CATALOG. Call and order your FREE 144-page catalog, featuring thousands of top-quality products. NO OBLIGATION. 1-800-639-CATV

Sprint North Supply

Reader Service 7

On Line, On Call, On Time.

Sprint.

markets in 1997," Nogueira says.

GTE plans to charge ADSL users "between $40 and $100" per month.

ADSL can link at rates between 1.5 and 6 Mbps downstream, and between 64 kbps and 640 kbps upstream. By contrast, cable modems offer shared speeds that top out at 27 Mbps downstream, and 1.5 Mbps upstream. Microsoft is also testing a handful of cable modems on its campus in conjunction with TCI (which recently took over the Redmond system from Viacom).

Through this trial, Microsoft executives hope to find out more about what it takes to operate its Windows and Windows NT products at ADSL speeds, as well as discovering what kinds of new applications work and identifying critical system integration factors to aid in future deployments by GTE and other telcos.

Ameritech, which has numerous cable TV franchises under its belt, also plans to test ADSL technology with IBM in Chicago. The six-month, 200-customer trial will be used to determine the viability of ADSL and if it can be effectively used by the Bell company.

Spurred by this new surge in interest in ADSL technology, Nortel and chipmaker Broadcom Corp. plan to work together to develop a single chip, rate-adaptable QAM transceiver for use in Nortel's carrierless amplitude phase modulation (CAP)-based ADSL access products.

The ADSL device will be based on Broadcom's QAMLink that is already being used in cable TV set-tops and modems. The chip will support data rates of up to 52 Mbps, depending on the telco's copper loop length. An integrated adaptive equalizer will make it possible for ADSL units to be used in loop lengths of up to 18,000 feet.

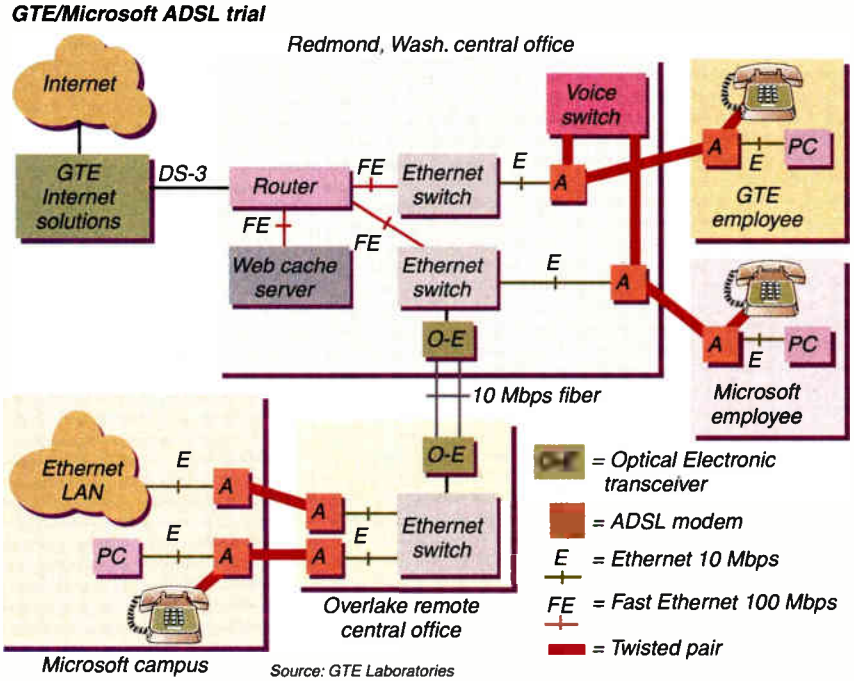
Finally, Analog Devices Inc. has developed a new, integrated ADSL Discrete Multi-Tone (DMT) chipset solution that promises to enable manufacturers to build modems more quickly and cost-effectively. The rate adaptive chipset incorporates a host processor, line driver and full protocol software–as well as a low-cost transceiver.

Russ Johnsen, VP and General Manager of Analog Devices' Communications Division, said the development of a $50 transceiver makes it possible to price the entire chipset solution, including the host processor and line driver, at $80. He said the company will be offering sample chips to lead customers as early as December of this year.

The chipset is fully featured, comprised of a DMT transceiver, a DSP (digital signal processor) host processor, a line driver and control software. It offers standard performance of 6 Mbps downstream and 224 kbps upstream. Depending on the length of the telephone loop, it can transmit data at rates well in excess of 8 Mbps. It can also be configured to deliver rates of 4.5 Mbps downstream and 450 kbps upstream.

Using rate adaptation, the chipset offers optimum data throughput for each telephone line by assessing the line's condition and transport capacity and then determining the best possible data rate.

GTE/Microsoft ADSL trial



Source: GTE Laboratories

HP defends itself; seeks $4M settlement

Hewlett-Packard has decided to fight fire with fire and has named Computer Aid Corp. of Pennsylvania and its New York law firm in a $4 million libel lawsuit that also seeks to dismiss Computer Aid's earlier complaint that HP misappropriated trade secrets related to network management software.

In its motion, HP argues that the U.S. district court in which Computer Aid's lawyers filed a $100 million suit against HP lacks the jurisdiction to hear the case. Furthermore, HP is suing for libel, basing its complaint on a press release issued by the law firm of Anderson Kill Olick & Oshinsky that it says makes "false and defamatory statements concerning HP."

Although the company seeks to have the suit thrown out on jurisdictional grounds, HP issued a complaint that denies any of the wrongdoing that was alleged by Computer Aid in its 63-page complaint.

As noted in the July issue of *CED*, Computer Aid alleges that HP, former CaLan founder Syd Fluck and AM Communications breached a joint venture agreement and pirated a cable TV network management and diagnostic software program known as "Galaxy" as a result of HP's acquisition of CaLan Inc. in 1994. Further, the complaint alleged that HP since then asserted all rights to the software and even developed a product based on the software.

In its response, HP denied that any such "joint venture" agreement existed and further noted that Computer Aid was never able to "provide acceptable code for Galaxy," even with hundreds of hours of instruction and directions from CaLan and HP. Jay Spievack, a partner at Anderson Kill, says that notion is "ludicrous," and that HP "didn't provide any instruction, much less hundreds of hours of it."

Furthermore, HP argues that it later announced it had no plans to manufacture a "large scale monitoring, testing and incident tracking product such as the Galaxy system."

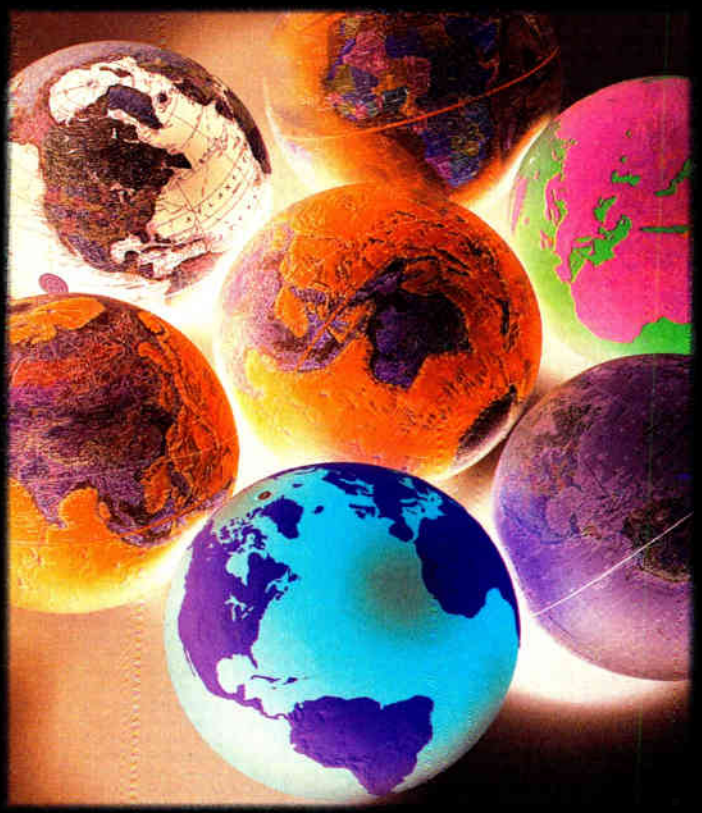
"We have reason to believe that the work they did was not usable and remains unusable today," said Peter Vogl, a partner with Pennie & Edmonds, the firm representing HP and the other defendants.

And finally, HP says it never used and does not plan to ever use any of the materials generated by Computer Aid in its effort to write code for the Galaxy product.

HP seeks a total of $4 million in libel damages from Computer Aid and Anderson Kill for several statements made in a press release that was issued on June 5.

In response, Spievack referred to the motion

CABLE TV OFFERS A WORLD OF OPTIONS.



SO DOES iCS.

Cable television technology continues to evolve. New opportunities place new demands on suppliers. That's why we've created the ultimate full-service cable distributor. Itochu Cable Services. iCS unites the proven resources of **VueScan, Cable TV Supply, Kelly Cable Services,** and **DX Communications** to provide the full range of products and repair services for the entire cable and satellite communications industry.

- **iCS** is the world's largest stocking distributor of GI products, including the next-generation MPEG-2, and is authorized by GI to repair warranty and non-warranty converters.
- **iCS** promotes a full selection of the best in CATV industry products.
- Backed by the worldwide resources of the Itochu Group, **iCS** operates distribution and service centers throughout North and South America.

The ultimate cable supplier

iCS
ITOCHU Cable Services Inc.

Reader Service 8

Sales
Deerfield Beach, Florida
800-327-4966
Carson, California
800-222-0052
Cleveland, Ohio
800-858-0830
Denver, Colorado
800-728-9887
Atlanta, Georgia
800-787-2288
Mt. Laurel, New Jersey
800-817-4371

Repair
Prospect Park, Pennsylvania
800-352-5274
Milwaukee, Wisconsin
800-555-8670
Deerfield Beach, Florida
800-865-3692

International Sales & Service
Buenos Aires, Argentina
54-1-582-9695
Santiago, Chile
56-2-335-2070
Sao Paulo, Brazil
55-11-246-9994

DX Communications
954-427-5711

to dismiss as simply "wrong," while characterizing the libel suit as "smoke and mirrors." Vogl counters: "I believe (we'll) show it's more than smoke and mirrors. The comments made on behalf of the client were unnecessary and gratuitous."

Anderson Kill has until October 10 to file additional documents in response to HP's counterclaim.

Continental taps Cabletron for software

Continental Cable has tapped Cabletron Systems to help integrate video and data services to its customers, in a deal announced in August.

Cabletron's "Spectrum" software system will be used to provide end-to-end management of Continental services for the MSO's C2IT customer service system (formerly called Concert). In fact, Spectrum is already managing LANcity modems, Lightstream ATM switches, AT&T Paradyne modems, Cisco routers, Compaq servers and Cabletron hubs.

Within the C2IT system, Spectrum oversees a variety of applications, including Cheetah Net (hardware environment analysis); trouble ticket generation; work order dispatches through Arrowsmith's Fleetcon system; and billing through CSG/Phoenix.

"Our goal is to have a system in place that informs us of problems first, so that we can take immediate corrective action before the customer experiences a loss of service," says Robert Strickland, Continental's senior VP for information services.

Digital set-tops finally have their day

With all the focus on data modems, two significant events related to digital set-tops took place recently, but were barely blips on the news radar screens. First, General Instrument announced it had produced the first 10,000 of its DCT-1000 set-tops, and then Zenith won a huge contract from the americast telco consortium for 3 million units.

GI rolled out the red carpet for the press and its customers in late August, as it hosted "Digital Deployment Day" at a downtown Philadelphia hotel. The briefing and tour were intended to drive home the point that digital technology is–finally–in hand and ready for prime time.

In addition, a variety of service providers were on hand to demonstrate the power of the MPEG-2 compliant set-top and related digital equipment (which is no longer being referred to as DigiCable as GI has backed away from proprietary approaches). Companies like StarSight, Wink, WorldGate and ACTV, among others, demonstrated how their services work in the digital domain.

GI executives were clearly relieved that the product has now entered the production phase. The company plans to ramp up quickly to where it begins producing between 40,000 and 50,000 units a month–or about 200,000 by year-end.

"We're past the point of playing around," noted David Robinson, VP and GM of digital network systems at GI. "You'll see really big volumes (perhaps as many as 1.5 million units or more) in 1997," he said during the press briefing at GI's headquarters in Hatboro, Pa.

GI executives also said they were eagerly anticipating the deployment of digital technology, upon which the company has spent upwards of $250 million in the past five years.

Meanwhile, americast–the programming development consortium of Ameritech, BellSouth, GTE, SBC Communications and The Walt Disney Company–has chosen to purchase at least 3 million digital video set-tops from Zenith Electronics Corp. over the next few years. The deal is valued at more than $1 billion and represents Zenith's first major set-top win in several years.

The set-tops will feature QAM-based components and signal compression technology developed by Divicom. However, the units will be manufactured by Zenith in accordance with americast's specifications.

The consortium has chosen to use the "network interface module" approach that allows them to use the same basic platform, while plugging them into either MMDS, DBS, switched digital video or HFC networks. The units will go into production during the first half of 1997.

CED adds Tangney as accounts manager

CED is pleased to announce the appointment of Michael C. Tangney to National Accounts Manager for the magazine.

Tangney comes to *CED* from inside the Chilton Company, where he served as regional sales manager for *Home Improvement Market* magazine, a long-time Chilton publication formerly titled *Hardware Age*.

Prior to his tenure with *Home Improvement Market*, Tangney was central region manager for *Do-It-Yourself Retailing Magazine*, a publication of the National Retail Hardware Association. He has held other publishing positions with *Expo Magazine*, Hachette Publishing Company and Hallmark Data Systems. He is a graduate of the University of Iowa. Tangney and his wife will relocate to Denver.

Jottings

With the cable industry finally focusing on deploying digital transport equipment, **CableLabs** is now busy sifting through responses to its formal request for information on home digital equipment. The RFI, to which responses were due Sept. 30, sought information on the impact of a plethora of new digital devices, including personal computers, digital video disk players, VCRs, TVs and other equipment that could have an impact on cable set-tops and modems. Specifically, the RFI sought info on the low-priced "Internet computer appliance," other digital devices and trends in customer premise architectures. The RFI was sent to 200 companies . . . **The Joint Procurement Consortium,** a purchasing powerhouse consisting of Ameritech, BellSouth, Pacific Bell and SBC Communications, issued an RFP for ADSL equipment to 39 companies in July. The RFP calls for technology to be based on carrierless amplitude phase (CAP) modulation and to have two sources of components to encourage compatibility with discrete multitone (DMT) products. The consortium wants to purchase up to 70,000 ADSL links (at a cost of about $100 million) and wants to see prototypes this autumn . . . **Microware** is jumping on the Internet TV bandwagon and is targeting that market segment for its OS-9-based DAVID system software. It has already signed Mitsubishi as a licensee. The DAVID extension allows TV viewers to surf the Web via their TVs (the company earlier this year licensed Java and HotJava technology). Separately, Microware's system will be embedded into Mitsubishi's DiamondWeb Internet TV . . . **International Billing Services** signed a technology agreement with **AT&T** to develop software to aid AT&T in controlling billing statement production. The agreement provides for the licensing of software technology to AT&T as well as professional services to customize the software to AT&T's needs . . . **Nortel** has joined the Entertainment Technology Center's efforts to build a high-speed secure network for the entertainment industry. The ETC, created by the University of Southern California, hopes to build HollyNet, as it is termed, which will allow production and post-production sites to electronically collaborate and perform a variety of editing and production functions. Nortel joins a lengthy list of studios, telecommunications and computer companies on the effort . . . . CED

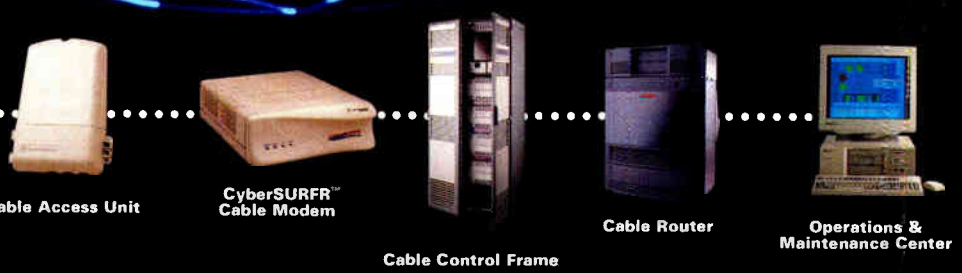
–Leslie Ellis contributed to these stories.

CONNECT A SEA OF SUBSCRIBERS

Motorola's Panama Chip

TO AN OCEAN OF COMMUNICATION.

CableComm Technology



Clear Sailing. Now is the time for system operators to set a course for Panama. Motorola's new Panama™ Chip Set has been created exclusively for the cable industry to provide a reliable, efficient link from broadband networks to the world of telephony and beyond. An integral part of CableComm technology, the Panama Chip Set clears the communication passage to system operators and establishes a new route filled with oceans of untapped revenues.

This advanced Panama Chip Set, embedded in CableComm Cable Access Units, provides operators cost efficiency through unprecedented spectrum and power management. Developed from the ground up by Motorola, this new component combines all of the company's core competencies. With their unmatched RF expertise, their position as the world's largest manufacturer of modems and industry leading semiconductor technology all integrated into one product family, Motorola's CableComm technology will take your system right into the land of opportunity. Now, with the incredible efficiency and reliability of the Panama Chip set, Motorola has contributed yet another of its core competencies to this next wave of advanced service offerings.

System operators your ship has come in. Once again Motorola's foresight has brought forth a new generation of revolutionary and reliable technology. So steer clear of other systems' dire straits and focus on THE total system solution. Motorola's CableComm technology; now featuring the Panama Chip Set.

Reader Service 9

MOTOROLA
Multimedia Group

http://www.mot.com/multimedia • 800-2WAY-HFC • 847-632-3409

What you never thought possible.™

Rolls brings more than a decade in data to Cox

Jay Rolls

This past April, a helicopter dropped off Jay Rolls, two companions and a guide in the middle of nowhere, on a still, blue glacier in Alaska's Denali Park. Temperature: zero degrees Fahrenheit. From there, the party hiked through the bitter cold to a 10-foot by 10-foot cabin, which they would call home for the next several days–melting snow for drinking water, eating freeze-dried provisions and sheltering themselves from the Alaskan "spring"–while touring the treeless wilderness on skis. And to think, Rolls *paid* to go on this excursion.

Not one to be easily scared off by a new challenge, Rolls, who is director of multimedia technology for Cox Communications, will find his intestinal fortitude comes in handy as he prepares Cox to offer data communications to the home: both via cable modems, and via fiber directly into multiple dwelling units. Working out of the MSO's Atlanta office, he is actually the corporate engineering point-person for those projects as he deals with vendors, stays current on market activities, coordinates among all the different competency groups within the company and in the cable industry itself, and ultimately, rolls out cable modems to the operator's top markets.

As part of that roll-out, Rolls and his group are doing a lot of customer handholding, going into test users' homes and installing software and modems, while talking them through the new service. It's also his job to educate Cox systems around the country in the ways of the data world. "I come in and do a big knowledge dump of all the things that we have learned, acting as an information facilitator," explains Rolls, "so that if we learn something in Phoenix, we make sure that our people in Orange County don't make the same mistakes."

On a larger scale, Rolls is working to move the industry toward the standardization of cable modems through his participation in the MCNS group, work which includes helping to draft a security spec. Though he predicts that cable modems will be sitting on retail shelves by the end of next year, Rolls notes that it has been challenging to foster industry cooperation to that end.

"How do you get all of these vendors with disparate and personal interests to come sit at the same table?" he asks. "Some are smart enough to realize that it's in their best interest to do it, but others think that they have a lead, and a position that they don't want to give up."

Starting in 1983 when Rolls, fresh out of the University of Virginia with a B.S. in electrical engineering, went to work in system and hardware design of air traffic communications control equipment, he has immersed himself in every aspect of data communications technology. His background includes:

✔ Two years ('83-'85) with the United States Foreign Service working with secure data communications, while, incidentally, traveling throughout Africa.
✔ Writing an entire operating system in firmware for a dual-Intel-8051 secure fax terminal while working for Reston, Va.-based Valutec Inc.
✔ More than seven years spent with BBN Communications Corp. in Germany, a company which founded the Internet, working under a government contract. Rolls has been working with the Internet since 1986.

While at BBN, he managed the European Defense Data Network, an X.25 packet switched network that functioned as an Internet for the military. In earlier work for BBN, he developed a graphical front-end display and control system (about 5,000 lines of C code) which made the display of data network status more user-friendly. Eventually, Rolls worked his way up to general manager of BBN's European operations and program director for all government systems contracts in Europe.

Because of the military drawdown in Europe, Rolls left BBN in 1993. Then the real fun began when he went to work for Alcatel SEL in Stuttgart. "Business was conducted in German, and I didn't know (the language) when I got there," he recalls. "I was picking it up while I was with BBN, but the first four months were really frustrating. But then, it became much easier."

Working at Alcatel as program development manager in the company's IBN (Interactive Broadband Network) Systems Integration group, Rolls augmented his cache of data knowledge with experience in broadband projects. Those projects included introducing video-on-demand products and services, as well as working on two German field trials with DBP Telekom. Experience in the integration of servers, ATM switches, set-tops, and network and subscriber management systems proved to be a perfect complement to Rolls' wealth of data knowledge, as well as an attractive combination to cable industry execs. Cox recruited Rolls about a year ago to focus on its data activities, and yet still stay active in VOD.

Why drive when you can ride?

Now that Cox has brought him back to the United States, Rolls is working on readjusting to the local customs, including "the car mentality," burgers and fries and "a thousand other little things."

A self-described "extreme sports person," he races mountain bikes, runs triathlons and continues to travel to exotic locales, a la his Alaskan adventure. Sharp-eyed viewers of the recently-concluded Centennial Olympic Games may have seen Rolls riding his mountain bike during the closing ceremonies.

He has biked from Hanoi to Saigon, has climbed Europe's Mont Blanc, and next up, Rolls will tackle a bike trail leading from Yellowstone Park up into Canada.

As for his adventures in cable, Rolls is looking to grow his new department, both in terms of personnel, and profits. "I am optimistic that cable will make a major impact on the Internet, and on the whole data business," he concludes. *–Dana Cervenka*

The [Power] of Reliability.™

GENASYS™

Reliable power

Multiple energy sources

Fail-safe design

Interactive diagnostics

power node

power node

Introducing Genasys, the industry's first integrated power system with designed-in reliability not bolt-on redundancy. Seamless transition from multiple energy sources. Advanced bi-directional status monitoring and control. Reliable centralized node power systems from 1350 to 8000 watts.

Investigate the [Power] of Alpha @ **800-421-8089**.

Reader Service 10

alpha

co-located power / optic node

Alpha Technologies 3767 Alpha Way, Bellingham, WA 98226 Tel: 360-647-2360 Fax: 360-671-4936 Web: www.alpha-us.com.

Software has to be useful, not perfect

By Wendell Bailey, VP of Science and Technology, NCTA

No one who has written for this magazine has said as many negative things about computers and software issues as I have. Computer and software vendors have made it difficult for the average person to entrust his information and businesses to the systems sold for that very purpose. I don't believe it is necessarily the fault of the computer or software industry. I don't, for instance, believe that companies create bugs on purpose, or that they do a bad job of building hardware and developing software. What I put all of the vagaries down to is the conditions under which these enterprises are conducted; specifically, the rush to market that characterizes the efforts of these companies.

What this leads to, of course, is software that is much "bigger" than it needs to be in terms of resources demanded from the computer system (memory, speed, space on hard drives), and so complex that it is virtually impossible for the developers to fully test all of the circumstances under which the product and its many features will work.

This testing is not easy; in fact, it is time-consuming and costly, but it is the only way to discover what combination of keystrokes or multiple program uses would cause failure, or worse, some negative result that harms the system or other software loads. In fact, research has shown that many of the disasters that we read about in the newspaper–specifically, things that relate to airplane crashes, medical mishaps and chemical plant leaks–are mostly traceable to human beings relying on computers. It is often determined that the software controlling those devices was not able to determine what the correct course of action was, and thus, gave an incorrect response. This incorrect response, being relied upon by a fallible human being, resulted in a disaster.

States vs. software

Now, as negative as all of this sounds, I've recently read news reports about state governments' difficulties in implementing programs to replace those formerly administered by the federal government, in which the states' inability to perform was blamed on computer software. In a recent report, it appears that one state government had taken over the administration of several programs previously led by federal authorities. These efforts had previously used a lot of "people" resources in a system that was mostly using manual bookkeeping operations, and the state decided that it would have to computerize this program to increase its ability to serve its constituents.

The reporter who wrote this story noted that the state government had spent several years and many dollars trying to get this system computerized, but had been unable to do so.

This delay in converting to a computerized system is being criticized by the people who most desperately depend on this program for help. In defense of the delay, the spokesman for the state government said that it had been unable to get the computer software up and running to handle this program. He went on to say that it was a software program that required a massive amount of demographic data; that it was such a complex set of factors that no programmer was able to get the software working yet. State officials also admitted that in writing the program, they were paying many millions of dollars to software developers to write usable code.

As it happens, I heard another report not long thereafter from a totally different state in which fundamentally the same comments were made. The gist was that a program could not be completed, because the state or local government was unable to computerize the system–it couldn't find a program that was capable of handling the pertinent data.

It's not life-and-death

I'm afraid that I must protest. Not withstanding the criticism that is regularly heaped upon the software industry, the fact is that there are literally hundreds (perhaps thousands) of commercially available programs that work just fine for business entities all over the world. Many of these businesses need software to handle complex combinations of data that are very similar to the needs of our local government agencies. The fact that people who need to manufacture and sell products can find, install and use software of this type, while a state agency can't, is a puzzle to me.

One issue that someone will surely bring up is that a company making and selling widgets can tolerate a small number of incorrect computer actions, so long as a software program mostly does what needs to be done. After all, there's no real harm in losing a couple of extra widgets every quarter or so. In the world of welfare or public assistance, it is argued, one cannot use a program that might miss some deserving soul.

This sounds very nice, and it no doubt gives good cover to politicians, but the facts are that many people (both deserving and otherwise) are missed or mishandled by the existing system, and it does not take a genius to figure out that if most of the needs of the community could be handled while the effort to de-bug was underway, then this effort could be deemed more humane.

There is a lesson for all of us in here somewhere. If software is controlling an airplane, a nuclear power plant, an X-ray machine, or the like, then by all means, test the hell out of it. And then, don't trust it until you have more proof of its perfection. But in matters which are not life-and-death, less than perfect systems *can* and *do* serve a valid cause. CED

Have a comment?
Contact Wendell via e-mail at: wbailey@prodigy.com

DON'T BE RUN OVER BY THE WHEELS OF CHANGE

Making the right choices today will mean the difference between success and failure.

In todays changing environment, the wrong decision could cost your organization untold future revenue.

Stay ahead of the wheels of progress with the Power Guard 90 volt family of products.

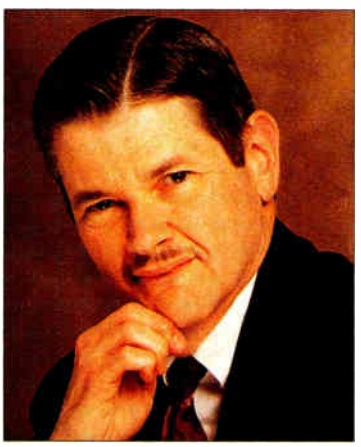
POWER GUARD

Reader Service 11

an ANTEC company

Northeast Division	Midwest Division	Southeast Division	South Central Division	West Coast Division	International Division	Latin America Division	Asia/Pacific Division
334-705-3650	708-910-0788	334-705-3511	334-705-3530	800-854-0443	334-705-3508	334-380-9244	334-705-3522
800-288-1507	800-288-1507	800-288-1507	800-288-1507	800-288-1507	334-742-0055	334-742-0055	334-742-0055

Bandwidth reduction: The early years



By Jim Farmer, Chief Technical Officer, Antec

We hear a lot these days about the tricks used in digital television to reduce bandwidth. Two general classes of techniques are used: lossy and non-lossy. The non-lossy techniques are tricky, but at least you know when you are creating a problem.

On the other hand, lossy techniques demand a much broader understanding, not only of bit twiddling, but of how the human visual system (HVS) operates. There is a real danger that we'll remove something the HVS can detect. That's when a viewer finds artifacts, or faults, with the picture. Artifacts are bad, but we have learned to live with certain artifacts in NTSC, and we may learn to live with more in the future.

Remember the old western movies, in which the wagon is slowing down and its wheels appear to be turning backward? This is an example of an artifact caused by the sampling that occurs when we simulate motion with a sequence of still pictures.

As good as the work of the MPEG committee is, the real tricksters were the people involved in coming up with the original NTSC system. Even the creators of the NTSC system stood on the shoulders of earlier pioneers.

Consider the idea that a series of still pictures could be put together in rapid succession, and the HVS would be tricked into thinking it was observing a moving scene. The more pictures you present a second, the better the fooling of the HVS, but the more "information" that has to be stored or transmitted, means we need more bandwidth. So how many pictures are needed?

Bandwidth sawing

About a century ago, the early motion picture folks decided to go with 24 frames per second. That was a lot of "information" to be stored, but even at that rate, flicker was easily perceived (thus the nickname "flicks"). Someone came up with the brilliant idea that, if each still picture was presented to the viewer twice, the eye would be further fooled into thinking it was seeing 48 individual pictures per second, rather than 24, each repeated. That was a bandwidth saving measure, but how could it be adapted to television?

The solution was interlaced scanning, in which every other line is painted. Next, the in-between lines are painted. The HVS is fooled in somewhat the same manner as it is in movies. (Interlaced scanning has its own set of problems, but it works.)

Each half of the picture is called a "field," and the two fields that make up the complete picture are together called a "frame," the same term used by the motion picture people.

Television had another problem, too. TV sets were to be operated from the 60 Hz power supply system, but in the early days, it was hard to come up with adequate filtering, such that AC hum didn't get into the picture. A stationary hum bar is not as objectionable as is a moving one, so people decided to raise the frame rate on television from 24 to 30 Hz, half of the line frequency. Early TV pictures were locked to the AC line, so the hum bar was stationary.

In a later article, I'll describe why pictures are no longer locked to the power frequency. One "attaboy" to anyone who e-mails me the correct reason (You have to do it before I publish the answer).

Picture trade-offs

In Europe, the power frequency is 50 Hz, rather than 60 Hz. Thus, the PAL system used in most of Europe is based on 50 fields, or 25 frames, per second. For this reason, TV pictures in Europe tend to flicker more than ours do. Because the flicker is more noticeable at high brightness levels, Europeans tend to settle for somewhat darker pictures than those to which we are accustomed.

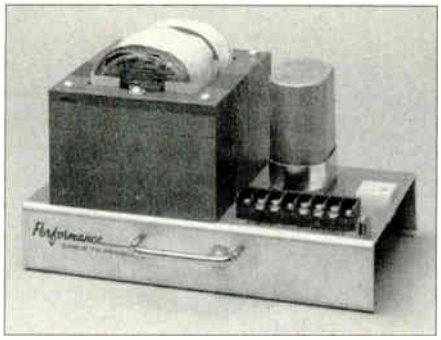
On the other hand, Europeans have more lines in their pictures than we do, so the pictures tend to be sharper. The number of horizontal lines in a picture is another issue in bandwidth reduction. A TV picture is painted as a series of nearly horizontal bands, starting in the top left corner of the picture tube, and working toward the lower right. The more lines in the picture, the sharper it appears vertically (we'll consider horizontal sharpness later). A sharper picture is said to have higher "resolution," measured in lines.

NTSC employs a total of 525 lines in the picture. That is, the electron beam traverses the screen 525 times before starting over with a new frame. The 525 lines include the so-called vertical blanking interval (VBI), the time allowed for the electron beam to reset from the bottom to the top of the screen. Take out about 22.5 lines in each of the two fields for VBI, and we actually display 525-45 = 480 active lines on the screen (a few less in practice).

PAL systems use 625 lines total. Take away the same number for the VBI, and you have 580 lines of resolution in PAL. Thus, PAL reduces bandwidth by dropping from 30 to 25 frames per second. Then it increases bandwidth relative to us, by using more lines of resolution. This represents more information that must be transmitted in each field. PAL pictures are sharper than NTSC pictures, but flicker more. Which is better? Well, you pay your money and take your pick.

In the next couple of months I'll explore other techniques that were used to reduce bandwidth in analog TV systems. The situation gets really juicy when color is added to a system that wasn't designed with that in mind. CED

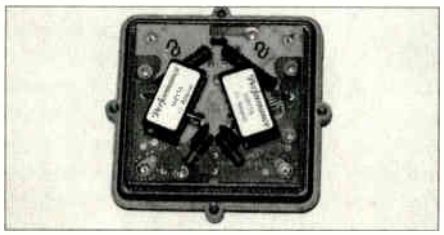
Have a comment?
Contact Jim via e-mail at:
jfarmer@ix.netcom.com



REPLACEMENT FERRO fits most manufacturers cabinets

The Performance Model FR2000 60V/16A Ferroresonant power supply is designed to replace or retrofit discontinued and obsolete power supplies. It fits most existing cabinet configurations and connects using existing wiring. Price is $299.00 Call 800-279-6330

Circle Reader Service #101



SURGE-GARD protects against nuisance fuse blowing and resets in 60 seconds

Self-resetting circuit breaker fits fuse clips in Jerrold SSP power inserters. The Performance Surge-Gard replaces fuses in locations where they frequently blow for no apparent reason causing unnecessary truck rolls. Merely remove the undependable fuse and snap-in the Surge-Gard. Specify Model SG15A for 15 ampere protection. Cost only $17.00 (100 & up). Call toll free 800-279-6330.

Circle Reader Service #102

VOLTEX CATV-27 Standby battery costs only $64.95

Best high temperature battery available! Normally outlasts valve regulated gelled electrolyte batteries two to one in CATV applications and provides as much as 15% longer run time. By far the best battery value on the market today. Call Performance today for details 800-279-6330.

Circle Reader Service #103

BATTERY TESTER checks 12 volt standby batteries automatically

The Performance Model BT 1200 universal battery tester checks gelled electrolyte and lead acid batteries in 10 seconds. Since batteries deteriorate gradually, regular testing with this unique device enables you to log changes in voltage levels as they occur. Having this history lets you know when to do preventive maintenance before a critical battery fails. Price is $250.00. Order today, call toll free 800-279-6330.

Circle Reader Service #100

The need for digital test equipment

Portable, cost-effective boxes in demand

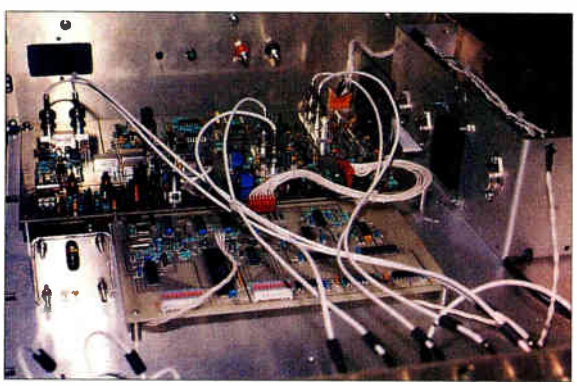
This article was written especially for CED *by the staff of Cable Television Laboratories Inc.*

The inevitable transition from analog to digital transmission schemes will allow MSOs to deliver dramatically improved picture quality, as well as increased content to subscribers, but with these expanded delivery capabilities come expanded technical headaches.

Cable operators are quickly recognizing that current analog testing equipment is useless in diagnosing today's typical digital transmission problems. However, CableLabs engineers are working to develop practical, digital test equipment that will enable engineers to diagnose and correct digital transmission breakdowns, according to Dr. Richard Prodan, senior vice president and chief technical officer, CableLabs.

David Eng, CableLabs' director of laboratory testing, says a TV set is often a technician's most effective diagnostic tool for degraded analog transmissions.

"If field service techs could only have one tool, they would rather give up a signal-level meter than a TV set," says Eng. "That's how effective a set is in diagnosing analog problems."



CableLabs' CW Tester*

However, in a digital transmission scheme, images are encoded at the headend, transmitted as bits of information and decoded in the set-top, which allows the image to appear on the TV set. Unlike analog video signals which degrade predictably, the error correcting capability of the digital signal results in no sign of degradation until the error corrector is overwhelmed and incorrect data is delivered, resulting in a complete loss of picture or data.

The result can be a frustrating experience for technicians who attempt to diagnose digital signal problems that exhibit no tell-tale symptoms. Prodan said two types of digital testing equipment are needed for digital transmission schemes to remain viable. The first, labeled out-of-service testing, examines the MSO headend to ensure digital information is being accurately and adequately encoded before it is transmitted. Prodan noted out-of-service testing is intrusive in nature and would require MSOs to either disrupt regular programming transmissions or switch to an auxiliary transmission method.

The second type, in-service testing, examines the actual digital programming signals captured at the set-top box phase of transmission to determine the integrity of the signal, says Prodan. This examination can't be intrusive because it would disrupt the very signal being recorded.

Because digital transmissions break down suddenly and without warning when they surpass their error-correcting threshold, both methods of testing would have the same purpose: to inform MSOs how close their digital transmissions are to being unrecognizable to the set-top.

"Digital's 'cliff effect' of degradation (compared to the gentle slope of analog transmission degradation) means you either have service, or you don't," says Prodan. "It is important for cable operators to know how much signal quality loss will cause catastrophic signal loss."

The ability to determine what, if anything, is disrupting transmissions is absolutely critical to the future of digital transmission, says Prodan.

"The result of disturbances such as noise, reflection and UHF ingress is catastrophic breakdowns, because they make the digital transmissions useless," he adds.

Eng notes UHF ingress will become an increasingly prevalent problem, as cable operators begin to transmit at higher frequencies than ever before.

Prodan notes that there is some existing equipment to examine digital transmissions, but he characterizes it as "not very portable or cost-effective right now."

Different equipment also will be needed to examine the upstream and downstream digital transmissions because they are not symmetrical in terms of performance. Early examinations of upstream transmissions have shown that a "funnel effect" of impairments occurs as electric currents seep into cable transmission lines. The cumulative effect of hundreds of houses' worth of impairments funneled to a single headend means upstream testing equipment must be calibrated differently to provide useful information.

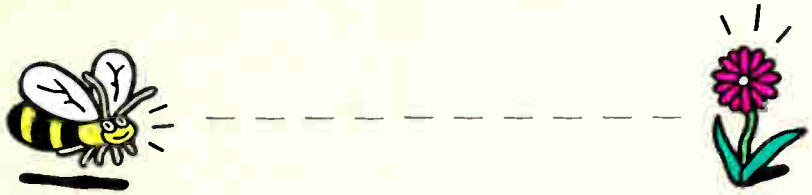
Prodan adds that CableLabs is working with three test equipment manufacturers to "productize" its CW Tester*, a device which allows cable operators to analyze their digital systems for upstream transmission error rates.

The next generation of set-tops will likely include diagnostic software that will indicate transmission impairments. The boxes could record impairment levels for future review by techs, or they could alert the headend immediately if signals arrive that are undecodable. The result would be a "smart set-top" whose nominal added expense would be made up for in MSO labor costs.

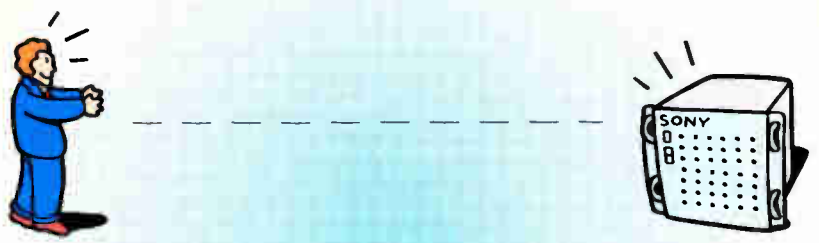
"Much of what you need in an analysis tool is already in the set-top box anyway," says Prodan. "All you would need to make it work are an interface and a software program that examines the signal quality as the box demodulates. In fact, cable technicians could run diagnostic tests when a box is installed as a preventive measure against numerous outage calls.

"MSOs will quickly catch on to the value of this feature once second-generation boxes are out," Prodan adds. "In fact, first-generation set-tops will probably establish the industry need for self-diagnosing capabilities." **CED**

**CW Tester is a registered trademark of CableLabs.*



(bee) (flower)



(client) (videostore)

For digital ad insertion, many people may be attracted to our VideoStore™ Multichannel Video File Server simply because it's a Sony.

That's true whether they're current clients, prospective clients or advertising directors. After all, the Sony name means superb image quality, unprecedented reliability and optimum flexibility. Not to mention the latest in technological advancements. Like our Predictive Maintenance™ feature. It lets you know of potential problems before they become real ones so your commercials air without mishaps, chaos or apologies. For the most efficient video clip distribution, our VideoStore system offers Wide Area Network connectivity. And as a result of our agreement with Channelmatic (the world commercial insertion market leader), you get peace-of-mind software that virtually eliminates mistakes. For more, call 1-800-472-SONY, ext. ADS. Or visit us on the Internet at http://www.sel.sony.com/SEL/bppg/videostore/index.html. Once you learn how our VideoStore system can enhance

your operation, we're sure you'll be attracted to it, too.

VideoStore™ Multichannel Video File Server

Reader Service 14

SONY

MediaOne: Investing in super headends

Consolidating from 12 headends to two

By Lynn Newsom, Vice President, Network Services, MediaOne; and Tore Nelson, Director of Headend Marketing, Scientific-Atlanta

MediaOne, a US West company and main provider of cable television entertainment services throughout metropolitan Atlanta, has embarked on a $350 million rebuild/upgrade of its Atlanta network, most of which was originally built during the late 1970s.

With the goal of creating a state-of-the-art 750 MHz hybrid fiber/coax system to provide entertainment, data, video and telephony services, MediaOne is also investing heavily in the "brains" of the network with the consolidation from 12 headends to two super headends.

MediaOne's project is an excellent example of what needs to be considered when consolidating headends to both immediately serve customers with a full complement of analog channels and also provide flexibility for future telephony, data and other digital services. Using the MediaOne headend rebuild as an example, this article will summarize some of the challenges and opportunities operators face when consolidating and rebuilding headends.

MediaOne's history

In December 1994, MediaOne acquired most of the cable properties in the Atlanta area, which provide service to a total of 475,000 customers. These customers were served by 12 separate headends. The quality of the headends and the distribution plant varied widely and clearly could not support the ambitious plans MediaOne had for its current and future service offerings. As a result, a consolidation and rebuild of the headends, along with an extensive upgrade of 12,000 miles of plant, was undertaken.

The objective of MediaOne's rebuild was to grow its customer base by investing in its headends to improve

Figure 1: *Service area map for the Atlanta rebuild project. Redundant ring headend interconnect path: From the Vinings super headend to the Stone Mountain super headend.*

The NOC will monitor all network elements, from the headend to the nodes

Sophisticated Technology, Simply Managed.

Introducing the NETWatch™ Element Management System from Harmonic Lightwaves. Our unique, Windows™-based system makes simple work of broadband network monitoring, diagnosis, control and maintenance. Just point and click.

If a network problem occurs, NETWatch initiates an alarm allowing you to instantly pinpoint the problem, then make corrections – usually on screen and in seconds.

There's no guesswork. Fewer truck rolls. Less overtime. And no costly service interruptions.

You design NETWatch to match your system configuration. Its open-standards platform gives you the flexibility to incorporate other manufacturers' hardware and to upgrade to support future generations of integrated element transponders.

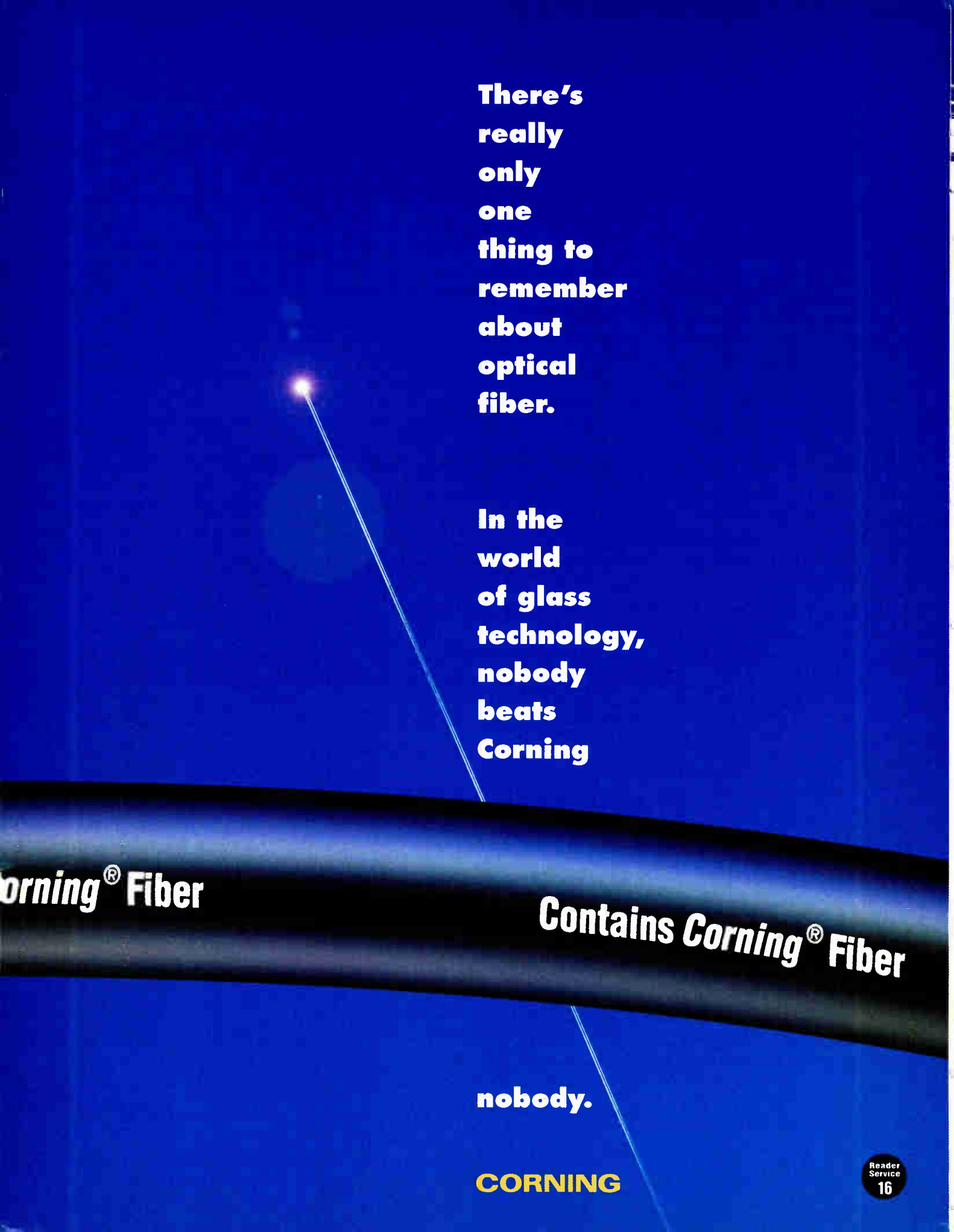
NETWatch is the latest of the advanced products from Harmonic Lightwaves and, like our full line of HFC network components, NETWatch provides technical superiority and exceptional reliability.

Connect with the source and see why the most advanced broadband networks rely on Harmonic Lightwaves.

Reader Service 15

Harmonic *Lightwaves*

549 Baltic Way. Sunnyvale. California 94089-1140. USA. 800.730.4099 408.542.2500 FAX. 408.542.2511


There's
really
only
one
thing to
remember
about
optical
fiber.
In the
world
of glass
technology,
nobody
beats
Corning
orning® Fiber
Contains Corning® Fiber
nobody.
CORNING
Reader
Service
16

the reliability, quality and efficiency of its operations. Ensuring future flexibility requires planning *now* for a future that is not completely understood, but one that will surely make the headend a more complex, critical and effective component in the delivery of programming and services.

With this scenario in mind, how does the headend contribute to improved quality, reliability and efficiency? Let's look at reliability first. Improving service reliability is the most significant reason for consolidating and rebuilding headends. There is no doubt the successful service providers of the future will need to offer their customers more than simple audio and video services. Customers will expect services like telephony, data and security. But customers will not purchase these services unless they have confidence in the service provider. Thriving as a service provider requires operators to improve the reliability of the network, and the headend is a good first place to start.

To improve reliability, headend equipment can now be monitored and backed up automatically, reducing downtime and improving customer service levels. Current headend management products monitor the combined headend output, scanning each channel constantly for key problems like loss of video or loss of modulation. If a problem is found, that channel is immediately removed and a backup channel is inserted, limiting service interruption to as little as several seconds. Without this tool, headend problems may cause interruptions that last for many minutes before a technician observes the problem or a subscriber phones customer service. Headend management tools can also control individual pieces of equipment, allowing operators to do remotely virtually anything they could do if they were standing in the headend. This feature is particularly valuable in controlling unmanned or remote headend locations.

The Vinings super headend, which is 25,500 square feet in size, will accommodate MediaOne's immediate and future needs. The building is one of two–the other is located in Stone Mountain. (All photography by Frank Zayas; photos courtesy of MediaOne.)

For the MediaOne network, system monitoring and control will be handled by the Network Operations Center (NOC). Operating 24 hours a day, 7 days a week, with a staff of 15 to 20 full-time employees, the NOC will monitor all network elements from the headend all the way to the optical and power nodes. The NOC utilizes a network management system provided by Megasys and is located at a nearby business office. A redundant system is located at one of the two super headends and is connected to the nearby office location via a Sonet backbone network.

Investment in the headend can yield some of the best performance per dollar invested

The Megasys network management system can manage a wide variety of network elements. As the MediaOne network grows, additional network element protocol subdrivers can be developed and installed.

Along with reliability, the quality of the signal reaching customers can be significantly improved with a headend rebuild. The combined carrier-to-noise ratio (CNR) is the specification that best measures the quality of the outgoing headend signal. Through the use of improved output convertor and vestigial sideband (SAW) filtering, premium quality modulators can improve the CNR by 3 dB to 4 dB over top-of-the-line modulators manufactured only a few years ago. Whereas older, coax-based distribution systems would have "drowned out" this improvement by the time the signal reached the customer, current HFC networks can allow this improved CNR to positively impact end-of-line performance. At a cost of $7,000 to $8,000 per channel, investment in the headend can yield some of the best performance per dollar invested.

The MediaOne headends utilize all new high performance headend electronics to take advantage of this performance opportunity.

The final reason for updating the headend is to increase operational efficiencies and

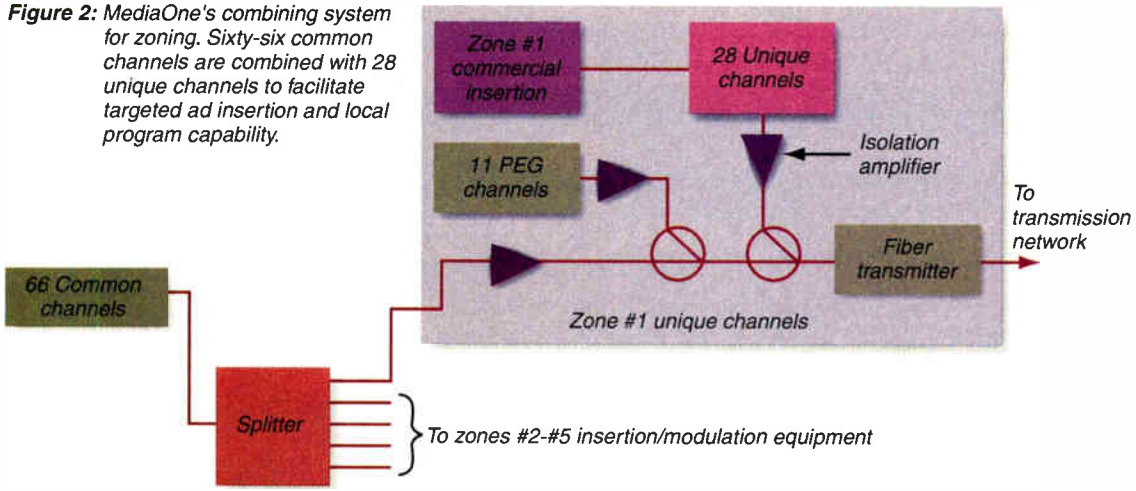


Figure 2: *MediaOne's combining system for zoning. Sixty-six common channels are combined with 28 unique channels to facilitate targeted ad insertion and local program capability.*

lower costs. Reducing the number of headends reduces the need for skilled operators and decreases the total amount of equipment and spares required, thereby lowering operational expenses. By consolidating from 12 to two headends, and by taking advantage of a network management system, MediaOne has significantly increased its operating efficiencies and reduced its costs.

Consolidation details

As mentioned earlier, MediaOne inherited 12 headends. These 12 independent headends were replaced by two new super headends joined by a fiber link for redundancy, as shown in Figure 1. Even a complete failure of one headend would not affect service, because the other headend serves as a backup.

Each headend is serviced by a separate antenna farm containing 4.5 meter antennas, one of which is motorized at each site. More than 200 fixed channel modulators provide 66 common and 28 custom channels to each of five zones. Plug-in frequency agile output convertors are utilized for modulator backup, and all channels are routed through patch panels for easy channel realignment and testing. In addition, a 32x32 matrix switch provides timed switching capability for special programming needs. Emergency audio and

DAWN... THE SATELLITE COMMUNICATIONS SPECIALISTS

FREE CATALOG

Professional

Before Dawn, end-users were in the dark about details relating to satellite communications equipment. Dawn Satellite specialists are meeting the product and service needs of today's commercial satellite users.

As product providers for the Radio, CATV, Broadcast TV, and Educational markets, we employ experts who can competently advise you on all your communications needs.

And, unlike some companies, our commitment to you does not end there — we continue to provide engineering and technical support even after the sale.

Expertise

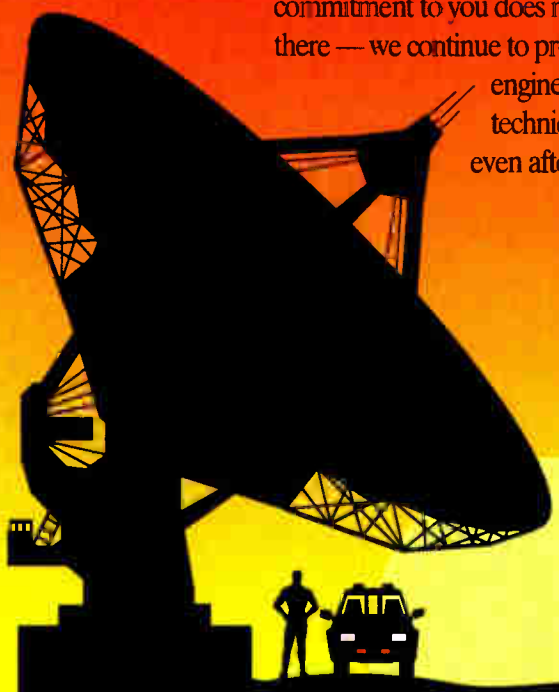
Dawn Satellite is dedicated to shedding light on all of your satellite communications requirements. Some products and services provided are:

Products:

- Digital Ready LNB's
- Satellite Antennas
- Block Translators
- Downconverters
- Satellite Receivers
- Cable and Connectors
- Antenna Motorization Systems
- Accessories

Services

- Technical Assistance
- Design and Engineering
- Installation
- Field Service



Dawn Satellite delivers only quality products with unparalleled service, in a very cost-effective manner. We will prepare you to meet the dawn of a new age in satellite communications.

Call Toll Free
1-800-866-6969

DAWN SATELLITE

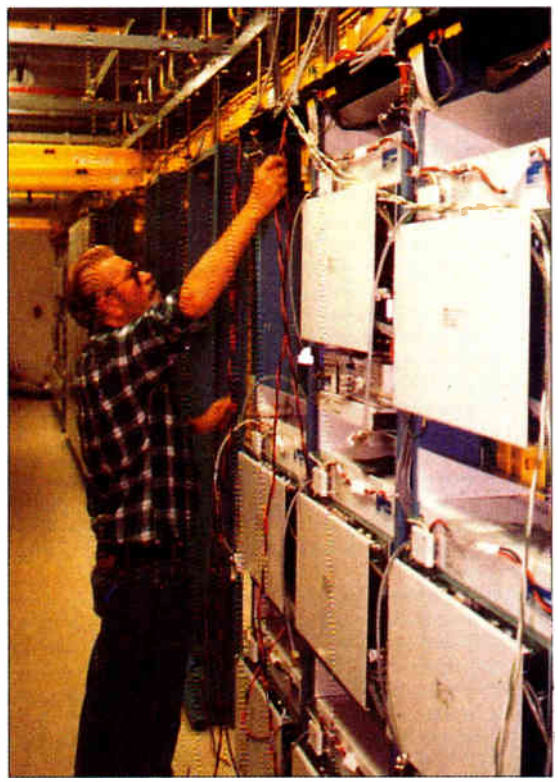
The Satellite Communications Equipment Specialists

Come Visit us at TeleCon XVI, Booth #848

3340 South Lapeer Rd., P.O. Box 9, Lake Orion, MI 48361 (810) 391-9200 Fax: (810) 391-9207

Reader Service 19

More than 189,000 miles of fiber will be deployed over the next two years



David Sharp, headend technician for MediaOne and for the Vinings super headend, makes an equipment adjustment.

video override capability is also provided to meet the upcoming Emergency Alert System requirements.

To save floor space, all equipment is racked in 84-inch tall racks. Plenty of room is left between equipment pieces for future expansion. All RF outputs are routed to a central location to accommodate monitoring by a future headend management system.

The off-air television signals will be replaced with a point-to-point special fiber studio that feeds from the television stations back to MediaOne's two super headends. The first three stations will be on-line soon, and the balance by year-end. These links will provide MediaOne customers with near studio quality television pictures. They will also benefit the local television stations if they have power or transmitter problems because programming will continue to MediaOne customers.

The MediaOne distribution network

While this article focuses on the headends, the distribution system has also been upgraded and is an important part of the project. The new MediaOne headends feed a hybrid fiber/coax 750 MHz distribution network with 42 distribution hubs, each serving 20,000 to 30,000 homes and businesses. Each distribution hub will have a diverse routed fiber optic 1550 nanometer (nm) headend feed with protection switching. The distribution hubs will deliver signals to more than 2,000 nodes of 500 homes each via 1310 nm fiber optic transport with a fully activated return in the 5 MHz to 40 MHz bandwidth.

More than one billion feet (189,000 miles) of fiber will be deployed over the next two years. As of this writing, over 400 million fiber feet and approximately 300 of the nodes have been activated. Network powering is served by about 2,100 power units, each rated at 5,400 watts, located at the optical node. The power plant is backed up by batteries, as well as a natural gas fuel generator.

Telephony equipment

A key part of the MediaOne strategy is to offer telephony service over the new HFC network. Therefore, a telephone switch and associated transport hardware have been co-located at the super headends. The switched telephony, alternative access and multimedia/data services will be transported to and from the distribution hubs via Sonet self-healing networks. Each network ring consists of Sonet intelligent multiplexers linked together in a ring configuration. The inherent route diversity and self-healing capabilities of ring architectures allow uninterrupted services to the customer in the event of a fiber failure in the backbone ring.

Additional distribution rings provide a dual homing configuration from MediaOne headends to interexchange carriers (IXCs) and local serving offices (LSOs), as well as business customers.

The zoning concept

As described above, the super headends provide 66 common channels to all subscribers. Additionally, each headend provides 28 channels to five zones served by each headend, for a total of 140 additional channels per headend. Figure 2 depicts the channel lineup and the combining for each headend.

Headend rebuilds offer operators an opportunity to set up a zoning strategy to improve service

By zoning video distribution from a super headend, an operator can cost-effectively provide targeted programming to smaller subscriber pockets while retaining the efficiency of one headend location. Customer service is enhanced by providing truly local PEG (public, education and government) channels, and advertising revenue potential is increased many times by offering targeted audiences for both local and regional advertisers. Presently, MediaOne generates more than $30 per sub per year in advertising revenue. With the cost of digital ad insertion gear at less than $10,000 per channel, payback periods are expected to often run less than 24 months.

A view of racks and racks of equipment provides some perspective on the sheer size of the super headend.

In summary, as product and service options available to customers continue to increase, retaining them will remain an ongoing challenge for cable operators. Meeting this challenge will require network investments to ensure reliability, quality and efficiency. The headend is becoming a more complex and critical piece of the network that can have significant impact on each of these parameters. A headend rebuild can offer the cable operator a competitive advantage, and investing in the headend can yield some of the best performance per dollar.

At the same time, headend rebuilds offer operators an opportunity to set up a zoning strategy to improve customer service and boost ad revenue. CED

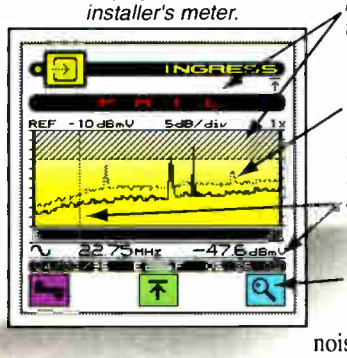


Figure 4: Sample ingress scan displayed on an installer's meter.

Limit with pass/fail indicator simplifies test for installers.

Peak hold function catches transient ingress.

Marker identifies ingress frequency and amplitude.

Zoom feature quickly narrows scan around marker, speeding up the scan.

Even if advanced services are not being activated in a system, proactive preparations now will be a big benefit later. With access to subscribers' homes very limited, operators must take advantage when access is given–during the installation.

Utilizing good installation practices and testing procedures can be one of the most important steps in minimizing noise and ingress and ensuring good performance of the reverse plant. This is opposite to conventional cable TV forward-path-only wisdom, which says: "take care of the feeder network, and the customer should have good service," or "no one else will suffer if one person has a bad drop." This is obviously not the case anymore.

After all, noise emanates from every home and, because of the noise funneling nature of a cable plant, noise from any one source can, and does affect many others. To be complete, installations for all customers, not just two-way subscribers, should be done carefully.

Quality installation devices need to be installed, and good installation practices followed. Using tri-shielded or better cable, quality weather-proof connectors, and proper grounding and bonding techniques are almost a necessity. Operators are learning that "little" things make a big difference. Potentially one piece of bad drop cable or one poor connection can wipe out an entire node for reverse services.

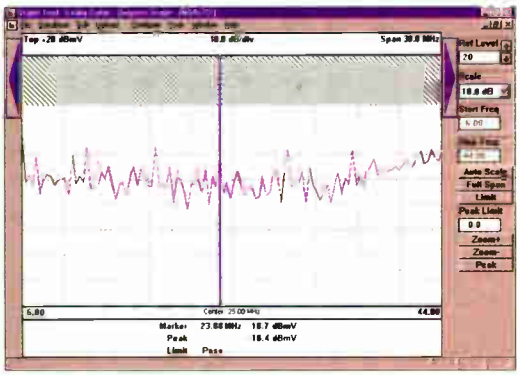


Figure 5. Ingress with a common path distortion component as displayed on a common PC-based analysis software package.

Diligent installation testing practices and comprehensive test equipment can help to ensure optimal forward and reverse path performance. The catch is that fairly comprehensive forward and reverse path testing is required to be effective, but to be practical for widespread use by installers, the test equipment must be affordable and easy to use. A spectrum analyzer, sweep receiver, signal analysis meter and leakage meter will help find and fix problems in a home; however, this combination is cost prohibitive and too complex for installers.

The good news is there are effective, comprehensive and cost-effective testing solutions available today. An easy-to-use installer's meter that combines simple signal level, leakage and ingress testing has the ability to verify forward path signals, identify and find leaks, and test the level of ingress and noise being generated by the drop system. This package of tests in one instrument helps ensure the installations are satisfactory and prevents future service calls (see Figure 2).

Video and audio level testing with a signal level meter provides forward path verification. This is the end result of proper alignment and forward path network performance. When properly performed, this quickly and clearly indicates if all channels are being received at the subscriber's drop at appropriate system design levels. The equipment should be capable of simple verification of pass or fail and, when desired, more extensive and detailed troubleshooting. Any level discrepancies that may affect picture quality should be made easily identifiable to the installer.

Leakage testing is no longer just to help systems comply with the FCC requirements. Testing for leakage, or egress, is an effective way to find sources of ingress. Loose connectors and poor shielding are typical places where signals can leak out of a system, and as such, they are also places for electronic noise and over-the-air signals to enter the cable system. Because a majority of sources for ingress and leakage are in the drop system, the best time to look for them is during the install while the technician is nearby and has access to the home. Leakage and ingress sources can be found and fixed in minutes if the tech is close to the source and has the right tools, preventing hours or days of troubleshooting later. In practice, after all drop cable is installed and connections are made, the technician should then walk through the subscriber's home with a leakage meter to identify any noticeable leaks. A simple near field signal strength leakage display will assist in finding leaks within

SENCORE

CABLE

Designed For Your Needs.

Sencore's new line of hand-held signal level meters were designed with one thing in mind – to make your job easier. Along the way we also developed the most rugged, easy-to-use meter on the market today.

Whether you're doing installations – trunk and feeder troubleshooting – or complete system performance tests – *we've got the meter to fit your needs.*

The new "CHANNELIZERS" feature easy-to-read, back-lit LCD displays that are foolproof in direct sunlight or night time work. Plus, they're designed to give years of trouble free service under all types of weather conditions and are backed by Sencore's 3 Year Extended Warranty.

Call us at 1-800-SENCORE (736-2673) ext. #530 to try one for yourself *absolutely FREE!*

Reader Service 23

SENCORE

3200 Sencore Drive, Sioux Falls, SD 57107

a home (see Figure 3). There really should be no acceptable leakage level that is totally ignored. Where leaks are found, the tech should do his best to fix or improve the situation.

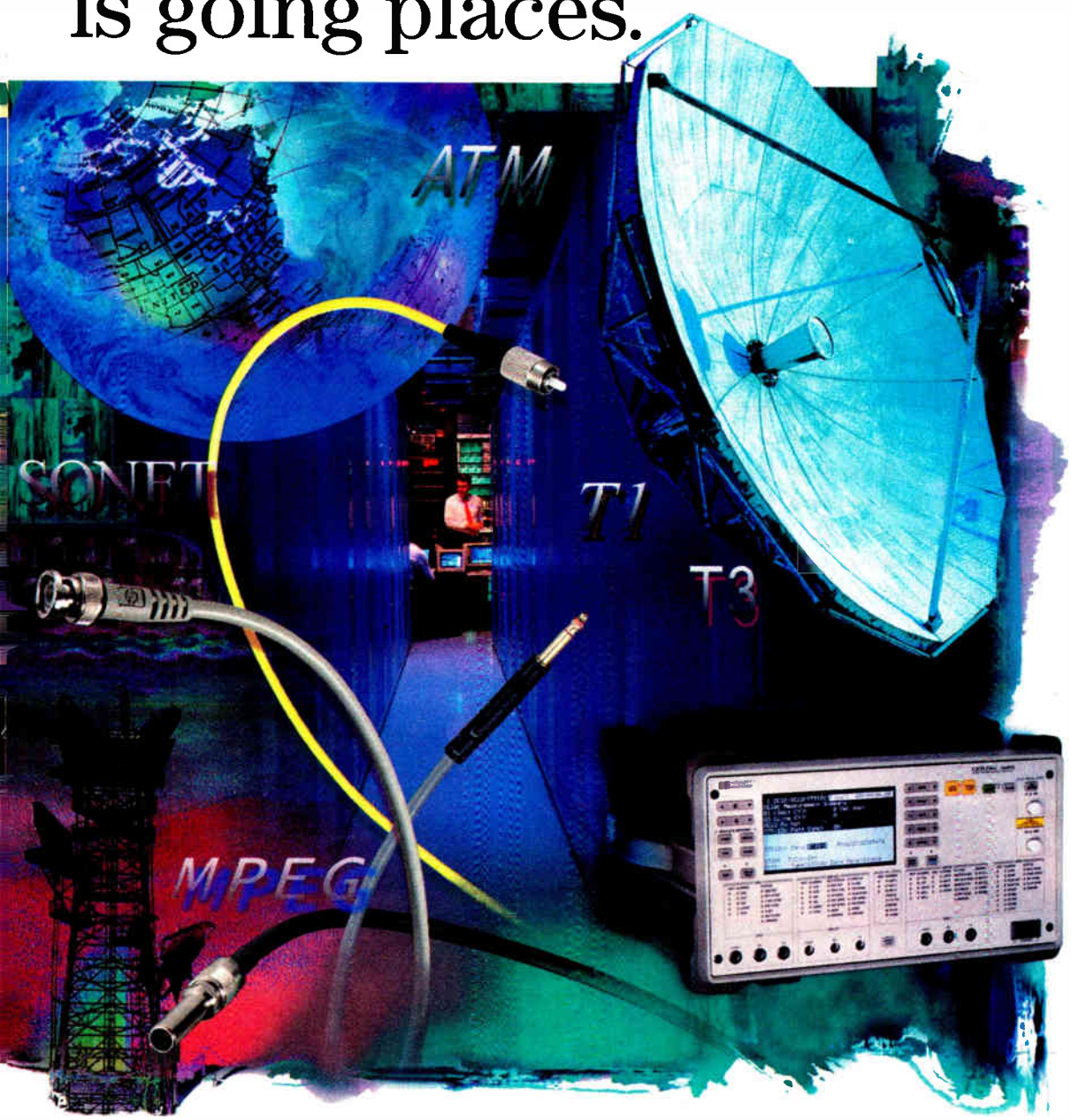
Testing the reverse path spectrum for sub-band signals being generated in the drop system improves the effectiveness of finding ingress sources and common path distortion. As stated above, leakage is a good way to find sources of ingress, but it is not 100 percent effective. Because of different propagation characteristics, different frequencies travel through materials and air differently. Also, in the case of very small leaks or ingress points, a lower level forward path signal may not leak out, but an external signal source (for example, a nearby CB or ham radio signal or electric heater) may produce a strong enough sub-band signal that ingress results. Thus, in some cases, a leakage meter alone may not find all the ingress points.

The ability to scan the reverse spectrum and display any signals found provides an additional method for identifying and finding ingress. A display of the reverse spectrum with clear preset limits allows the installer to easily identify if ingress exists (see Figure 4) in the drop system. Because this is available in an installer's meter, part of the standard installation practice should include a final test in which the installer views the reverse path before he hooks the subscriber to the tap. This will help to prevent hooking up a new drop that may immediately or in the future cause disruptions in reverse path services.

In addition to ingress detection, scanning the reverse spectrum can reveal other common reverse path problems such as common path distortion. Common path distortion can result from corrosion or oxidation on connections of dissimilar metals, as with many cable plant connections, causing a diode-like effect. When forward path signals pass through this diode, potentially harmful second- and third-order beats every 6 MHz can be created in the reverse path (see Figure 5 for an example showing major beats every 6 MHz). Common path distortion is being found often in drop systems, as well as feeder plants. Without looking at the actual spectrum, this problem is hard to identify.

In summary, many of the problems and heartaches currently encountered in operating a two-way cable plant result from ingress and noise. Because the generating source of a vast majority of the ingress and noise is in the drop system and the home, making strong efforts and investments during the installation will earn returns in the future. Combining quality installation practices and materials with comprehensive installation testing procedures is helping to optimize the operation of the reverse path and minimize future troubleshooting efforts. CED

The Central Office is going places.



Now available with STS-12c, E1 testing and Troublescan

The CERJAC 156MTS will take you there.

The CERJAC 156MTS is the single solution for portable, cost-effective SONET, ATM and T-Carrier testing, from OC-12 through DSØ. Its modular design lets you choose from a wide variety of options to support your testing and monitoring needs as they expand and evolve. Whether you need optical or electrical interfaces, pulse mask or jitter measurements, or multiple outputs, the CERJAC 156MTS has it all.

- ***New STS-12c/ATM testing option*** provides leading edge SONET STS-12c clear channel and STS-12c/ATM testing.
- ***New E1 testing option*** offers comprehensive E1 testing including DS3/E1 through OC-12/DS3/E1 mux testing.
- ***New Troublescan capability*** features a quick and easy method to determine SONET, ATM and T-Carrier errors and alarms.

For more information on the CERJAC 156MTS and the companion CERJAC 31XE test sets, call **1-800-9-CERJAC.**

CERJAC
A division of
HEWLETT® PACKARD

Reader Service 25

Insights into proper return path alignment

Digital troubleshooting is a whole new ballgame

By Bill Morgan, R&D Project Manager, Hewlett-Packard

Editor's note: *As the cable industry rushes to get into high-speed data, telephony and perhaps other services requiring real-time transactions, a critical network component is a reliable working return path. But that's easier said than done, many are finding. This article is part one of a three-part series on cleaning up the return path in preparation for advanced, two-way services. This initial installment focuses on return path alignment techniques; future articles will focus on ongoing maintenance as well as return path noise and ingress performance.*

Figure 1: *TV monitor connection diagram*

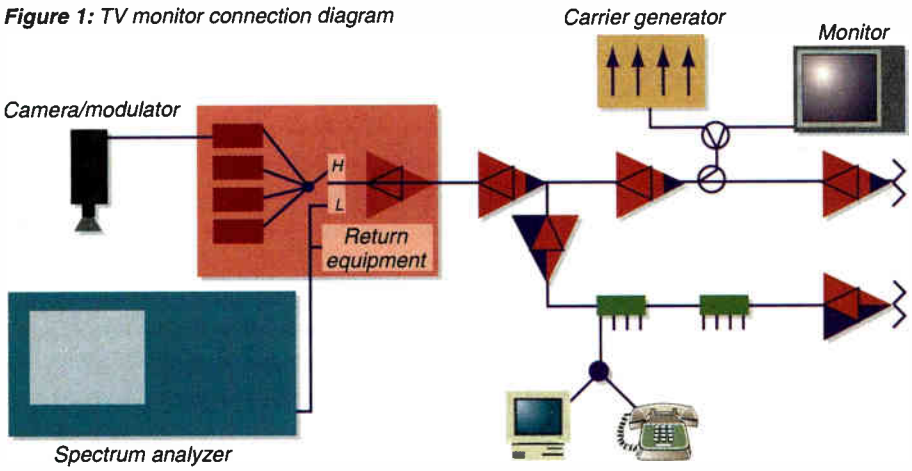


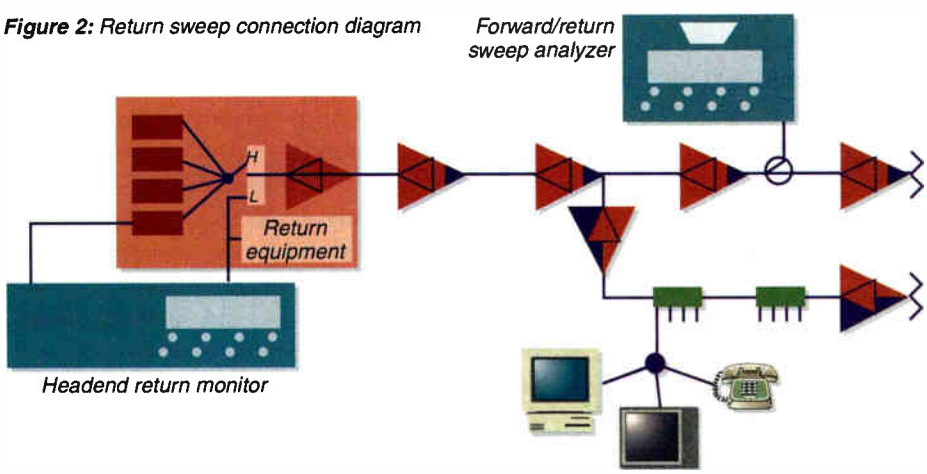
Table 1: *TV monitor with 4-carrier generator*

Pros	Cons
Utilizes readily available hardware	Technician carries multiple boxes
Ingress and gain balance on same screen	Requires 6 MHz forward bandwidth for each return monitor
Real-time ingress response simplifies troubleshooting	Limited frequency resolution

Table 2: *Return sweep alignment*

Pros	Cons
Uses minimal forward bandwidth	Slower ingress response
Provides best (variable) frequency resolution	Requires functional return communications (for sweep)
Technician carries one box for all measurements	

Figure 2: *Return sweep connection diagram*



The signing of the Telecom bill, coupled with consumer demand for interactive services in the home, has created the potential for cable television companies to explore new sources of revenue. They now have the opportunity to provide their subscribers with two-way services like Internet communications, interactive TV and telephony. But there's a catch–cable operators need to successfully activate their return paths before they can deliver these potentially lucrative new services. As the industry begins to activate the return path, a host of problems are surfacing. Many of these problems can be avoided if an accurate alignment procedure is followed.

This article provides insight into some of the problems that have been encountered while working with operators on alignment techniques.

Customer impact

Over the years, cable operators and technicians have become familiar with the picture artifacts related to poor alignment in the forward path, but the artifacts related to poor return alignment are new. Techs are no longer dealing with picture artifacts, but communications degradation. The ability to identify system problems by the type of degradation is in its infancy. These problems may include many of the following:

1) Source levels from modems end up higher than practical.

2) Excessive return levels cause clipping of the return laser, affecting all the signals on one return.

3) Communications throughput is reduced (poor response times).

4) Telephone calls are dropped or service is delayed.

5) IPPV requests respond slowly or intermittently.

Seven YEARS OF planning.

$11 Billion

in INFRASTRUCTURE.

Millions in programming.

One ITSY-BITSY F-connector.

No matter what you've put into your cable system, the profits don't begin until the signal actually reaches a customer. You simply can't afford to take chances with your most critical link.

That's where we come in. At ANTEC Network Technologies, we specialize in products that deliver your signal from headend to home. In fact, we devote more engineering resources to this critical link than any other company today.

Drawing upon the richest engineering heritage in the business, we manufacture a complete line of rock-solid products, from F-connectors to laser transmitters. And, we back them up like no one else, with 24-hour, 7-day-a-week technical support.

One great example is our new **Digicon™** Connector. It's the only F-connector in the business that virtually eliminates signal ingress/egress through a unique conical design that utilizes 360° compression during installation. In addition, its ability to pass digital signals allows you to provide advanced services in your network. **Digicon** has been tested to meet both Bellcore and SCTE standards.

To learn how our products can help you deliver the future more cost-effectively, and reliably, call 1-888-88-ANTEC.

ANTEC | **Network Technologies**

Reader Service 26

The Critical Link Specialist.℠

6) Customers experience service outages.

7) All of the above may be intermittent.

Problems in the forward path have typically been diagnosed by visually observing the degradation, but the digital communications inherent in return services makes this method of troubleshooting impractical. It also places even more importance on the quality of the initial return path alignment. One unique difference between maintaining the forward and return paths is that each test location in the forward path is affected only by the amplifiers closer to the headend, but amplifiers in either direction can affect the current location in the return path. For example, when sweeping the forward path, if the noise in the system increases, the technician knows the problem is between the current test-point and the headend. However, in the return path, the technician cannot be sure. The source of the problem could be on a different feeder or trunk altogether. In this case, not only is the technician faced with the challenge of finding the noise/ingress problem, he or she may also be faced with the problem of not being able to complete the testing of the current amplifier.

If a well-documented alignment procedure is followed, and the technicians understand the inter-relationships of how the return operates, these problems can be minimized.

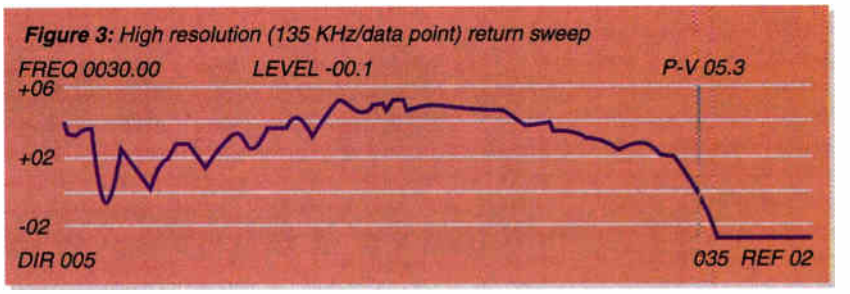


Figure 3: High resolution (135 KHz/data point) return sweep

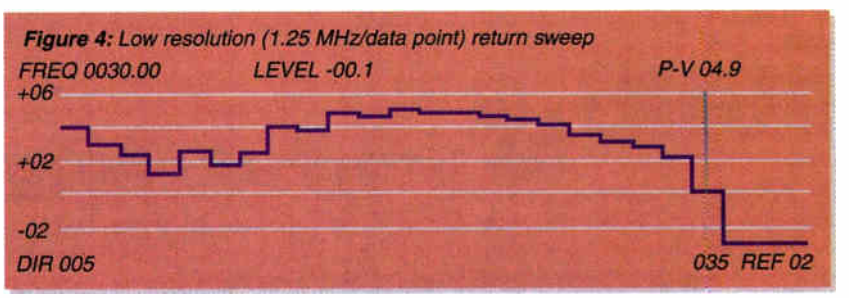


Figure 4: Low resolution (1.25 MHz/data point) return sweep

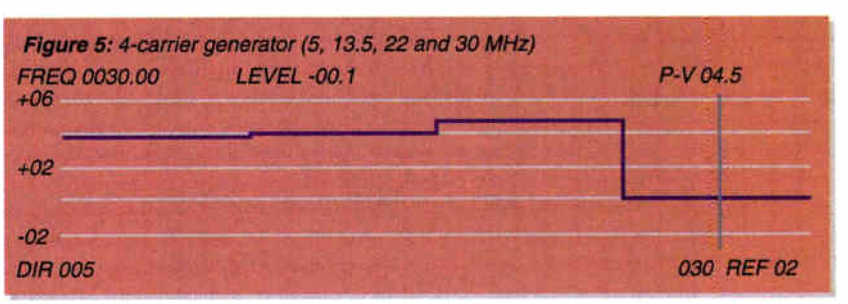


Figure 5: 4-carrier generator (5, 13.5, 22 and 30 MHz)

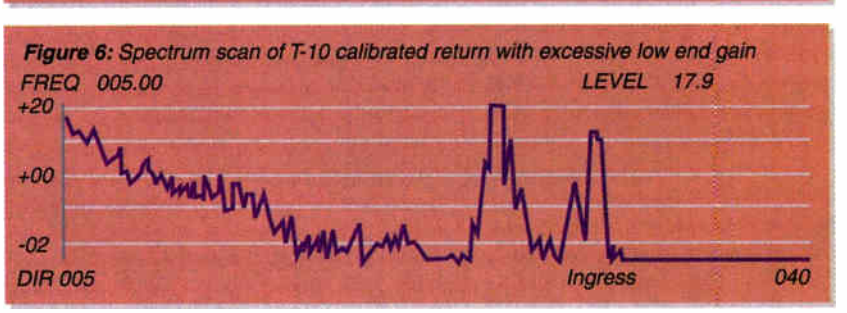


Figure 6: Spectrum scan of T-10 calibrated return with excessive low end gain

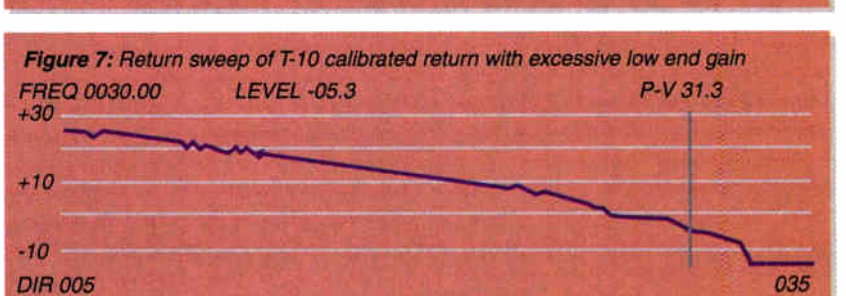


Figure 7: Return sweep of T-10 calibrated return with excessive low end gain

Alignment methods

There are currently many methods being used to align the return, but only the two most prevalent are discussed here because they do a good job of representing the range of capability:

1) **TV monitor** and portable 2- or 4-carrier generator in the field with a headend spectrum analyzer and video modulator to send the response downstream;

2) **Return sweep** generator with headend sweep receiver and ingress monitor. Tables 1 and 2 provide a short summary of the pros and cons of these two methods (see page 42).

One of the differences between the two alignment methods is frequency resolution. Quite often, the narrow bandwidth of the return path is used to justify lower frequency resolution. In reality, a 5 MHz to 42 MHz return path still consists of more than three octaves of bandwidth, only one octave less than a state-of-the-art forward path. Many of the problems found and resolved while aligning the system will be repeated over octaves and may be as significant in the lower frequency octaves as in the upper.

The sweep response traces shown in Figures 3 through 5 provide an example of the benefits of improved frequency resolution. Figure 3 is the response of a return cable system (11 amplifiers deep) indicative of a significant reflection which could push the error correction in a digital communications link to its limit. This sweep response was taken using 135 kHz of frequency resolution.

Figure 4 shows the same system response using only 1.25 MHz of frequency resolution. Note that the reflection which is obvious in Figure 3 could be missed in Figure 4. Figure 5 shows the same system response using a simulated four-carrier approach.

It is important to be aware of the tradeoffs being made when test equipment that provides less frequency resolution is selected. It is also important to be familiar with the passives in the system when using a carrier generator for alignment.

Roll-off in the passives may be compensated for by misadjusting the amplifier slope. Some of the newer 1 GHz passives roll-off below 10 MHz, so when using the carrier generator approach, the carriers should be placed at frequencies that are flat through the passives. In summary, a return sweep system with high frequency resolution has several advantages:

1) Flatness discontinuities and suckouts can be seen.

2) Roll-offs at the band edges are visible,

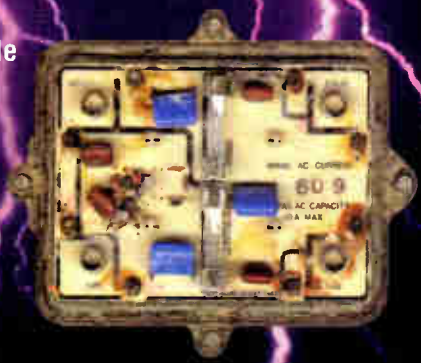
"AFTER 15 YEARS OF RAIN, SNOW, SLEET, AND FLOODS, IMAGINE HOW THRILLED WE WERE TO FIND YOUR SPLITTERS STILL HARD AT WORK."

—GUINN LEVERETT
President, Belhaven Cable TV

That is just what the Belhaven Cable TV crew found recently when they were upgrading their system.

Belhaven Cable TV is only one of the many satisfied world-wide clients who have come to know first hand that the RMS 1Ghz Plus™ products transcend well beyond today's industry standard, ensuring they will be working hard for you tomorrow.

Find out more about RMS 1Ghz Plus™ products, and be sure to ask about our lifetime guarantee. Call your RMS Distributor or 800-223-8312, today!



Actual Working Passive Device That Was Retired After 15 Years Of Service!

rms Electronics, Inc.

QUALITY CATV DEVICES THAT ARE BUILT TO LAST

RMS ELECTRONICS	RMS, UK	ERIVISION	SUPER CABLE S.R.L.	TELONIX COMM.	COMM WEST	NUCHEM AUSTRALIA PTY	PAMA CO. LTD.
800-223-8312	441-256-881-525	4162-391-1134	541-433-2427	800-667-2105	604-465-0068	6142-634-6333	426-515-7547
UNITED STATES	UNITED KINGDOM	SWITZERLAND	SOUTH AMERICA	CANADA	CANADA	AUSTRALIA	CZECH REPUBLIC

Reader Service 27

and diplexer problems may be eliminated.

3) Reflections and return loss problems show up as ripples in the sweep response and can be repaired.

4) Modern sweep systems with short duration sweep pulses can be used in the presence of carriers with minimal interference and don't take up the bandwidth required by CW carriers.

Ingress problems

If the return ingress is extremely high, repairs may be required prior to starting the alignment process. Experience shows that 70 percent of ingress problems occur in the home, 25 percent in the drop, and only five percent in the coaxial trunk and feeder itself. It is also becoming apparent that a major contributor to the ingress in the coaxial trunk is actually common path distortion. Excessive ingress can interfere with the sweep systems, and may drive the laser into compression, causing the output levels to be in error.

In order to follow the process described in this article for return system alignment, one needs to be able to start from the fiber node and proceed through the network (one visit per location being the goal). Return path "blockers," or some alternate methods of disconnecting the return input to the amplifier currently being tested, need to be available to establish proper set-up from the current location back to the headend. This will be an important step in reducing return path test time and meeting the one visit per location goal.

Once the proper pads and equalizers were installed, small amounts of noise caused no problems

Blockers are particularly useful on new systems where customers are not installed. If a new section is connected into an existing system, an ingress problem in the new section may degrade or disable the existing system. There have been many articles written discussing the source of ingress and solutions, and we have listed some of them in the reference section (see page 53).

Figures 6 and 7 provide an extreme example of how poor alignment techniques can aggravate ingress problems. This particular return path was "aligned" using the level of the T-10 carrier as a reference, but ignoring the slope of the return.

Because of the excessive gain at the low end of the spectrum, the return amplifiers were pushed into compression by small amounts of burst noise below 10 MHz. These bursts of compressed noise affected the entire return spectrum. Once the proper pads and equalizers were installed, the same small amounts of noise caused no problems.

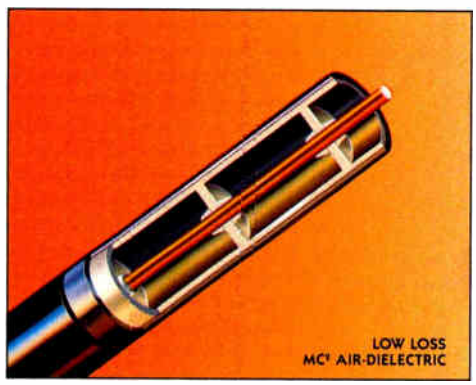
The traces shown in Figures 8 and 9 are of a properly aligned return and the associated well-behaved noise response of the return. Once again, it is important to have good frequency resolution in the headend spectrum analyzer to effectively identify and troubleshoot sources of ingress.

Alignment process

The approach to alignment of the return path is similar to the forward path in the sense that

TRILOGY COMMUNICATIONS INC.

THE ULTIMATE CABLE SUPPLIER



Innovation

Unequalled Fiber to Feeder Transmissions.

Proven Technology

Low Loss Cable Leader

TRILOGY COMMUNICATIONS, INC. ISO-9001 REGISTERED

&

Excellence

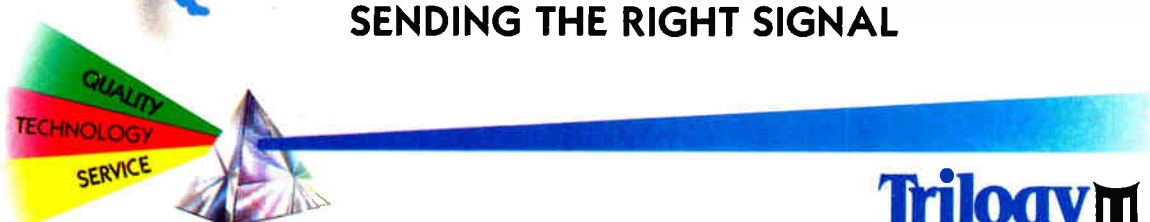
Superior Control Process

State of The Art Equipment

Guaranteed On Time Delivery

Trilogy Communications expends the same diligent pursuit of perfection in manufacturing dual-drop cables for TV/telephony installations, 50Ω cables for downlink transmissions, and RMC² radiating air-dielectric coaxial cable for open-air communications in highly developed or underground locations.

SENDING THE RIGHT SIGNAL



Trilogy
COMMUNICATIONS INC.

Call or write for free samples and brochure:
TRILOGY COMMUNICATIONS INC., 2910 Highway 80 East, Pearl, Mississippi 39208
(800) 874-5649 / (601) 932-4461 / FAX (601) 939-6637

Reader Service 29

it should be aligned for unity gain. In the return path, unity gain is referenced to the input of the amplifiers. In the forward path, unity gain is referenced to the output of the amplifiers. In each case, the gain of the amplifier is compensating for the loss of the section of cable between the previous amplifier (closer to the headend) and the current amplifier. Attention to detail in the return path is critical to successful alignment. A poorly aligned amplifier farther out in the trunk may make alignment impossible because of excessive noise in the communications path.

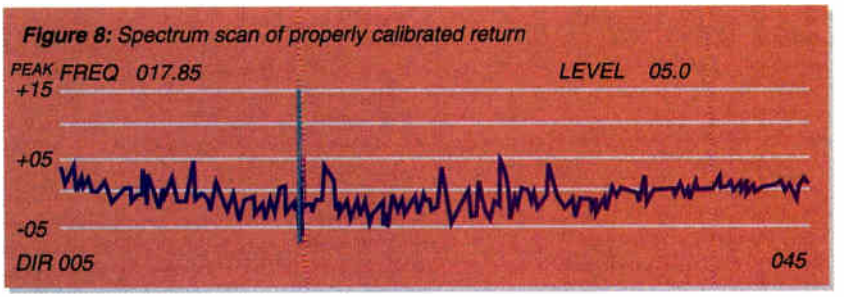


Figure 8: Spectrum scan of properly calibrated return

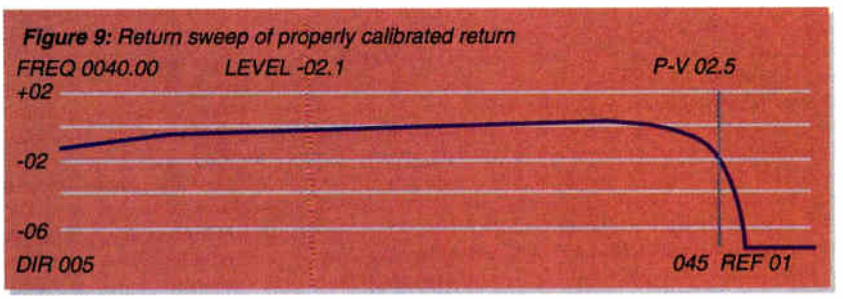


Figure 9: Return sweep of properly calibrated return

Reference output

The first step in the alignment process is to measure the output level at the headend for each return path using a given reference level input to the fiber node return laser. When choosing this reference input level, consideration must be made for low-end optical and RF noise floors, as well as high-end clipping resulting from overdrive. A typical manufacturer's specification for optimum input level to the return laser is +20 dBmV. This level assumes standard video carriers, and it is becoming common practice to use this as the reference level. Modern sweep systems are designed to operate 10 dB or greater below optimum carrier levels, so +10 dBmV is used as the reference input level in this discussion.

An accurate and flat input to each laser is necessary to establish the proper headend reference, and this input level must be maintained for the return system to operate properly. This input may be provided by either of the methods discussed earlier. The sweep system with higher frequency resolution has the advantage of allowing a tech to see problems in the return frequency response during the alignment.

EASy

A low-cost, low-effort solution to EAS compliance from the trusted name in CATV.

Easy Compliance.

Trilithic makes it fast and easy to equip your headend system to comply with the new EAS requirements. We provide a complete hardware and software system - from command receiver to decoder to control switches.

Easy Installation.

The Trilithic EASy System requires much less disassembly and rewiring of your headend system, saving you time and virtually eliminating installation costs. The entire system can usually be installed in one day, without hassles. The primary components of the system mount to the rear of your existing racks, so minimal additional rack space is required.

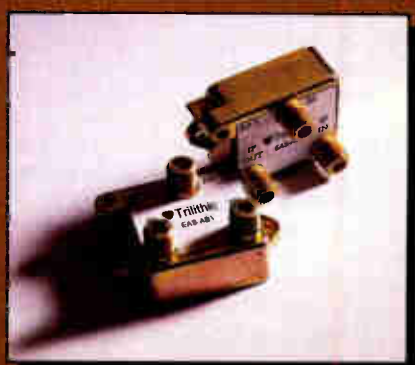
Easy On The Budget.

Because we've designed our system to minimize installation costs, the Trilithic EASy System is extremely cost-effective and convenient.

FREE QUOTE & SPECIFICATIONS.

Simply fill out the attached card and mail it or fax it to Trilithic. WITHIN 3 DAYS, a Trilithic representative will call you with a list of all the components you'll need to meet the requirements, and a price quote. You will receive a written quote a few days later.

Trilithic will help you meet all EAS requirements. From complete systems to individual components, we make EAS compliance fast, easy and cost-effective.



*Trilithic's EAS-AB1 switches install quickly and easily in the back of processors and modulators and require only **limited** rewiring and very little **additional rack space.***

RETURN THE ATTACHED CARD TODAY FOR A FREE QUOTE FOR YOUR SYSTEM REQUIREMENTS!

Reader Service 31

TRILITHIC

The Best Thing On Cable

9202 East 33rd Street / Indianapolis, IN 46236 USA

317-895-3600 / (800) 344-2412

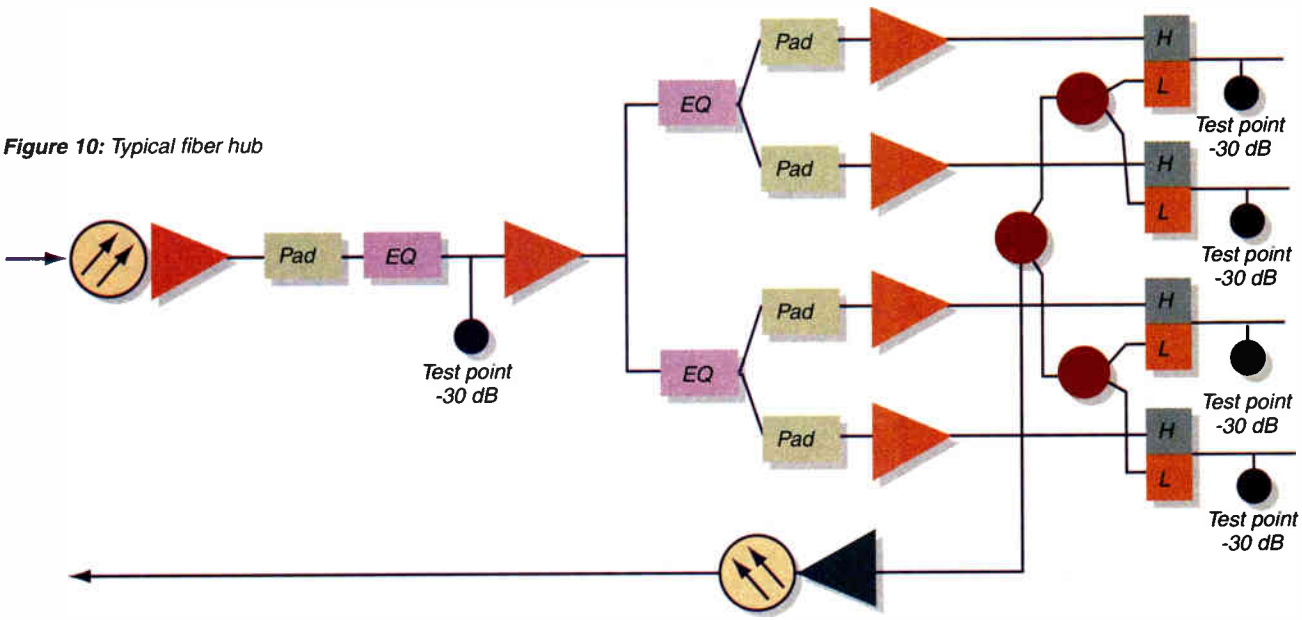


Figure 10: *Typical fiber hub*

It is important to be familiar with the amplifier and fiber optic block diagrams (see Figure 10). Internal coupling and test point variations determine the loss between the sweep insertion point (IP) and the input to the amplifier or laser. In our experience, not having this information has been a major contributor to alignment problems.

We recommend developing a level matrix for your equipment which technicians can refer to when setting the source level. A sample matrix is provided in Table 3 (page 53). It may be necessary to contact the manufacturers of the specific hardware to verify the configurations. This table should provide a concise summary of the internal losses in the hardware and the level required from the return sweep source to provide a known level to the active device. It is also necessary to have block diagrams of the hardware with the available return test points.

The need for a readily available concise summary of this information should not be underestimated. It is often the case that sweep technicians seldom know the configuration of the return test points, or what the losses are to the active devices.

Normalize outputs

With the correct input level to the fiber node or first return amplifier, the output at the headend is measured with a spectrum analyzer or sweep receiver. Because the output from each return will vary by different lengths of return fiber or coax, these outputs should be normalized to the lowest level return by attenuating the higher level returns. This step creates a common output at the headend for all returns, assuming +10 dBmV input to the laser or first return amplifier. This common output level is referred to here as the "X" level.

Check and align sweep response

All subsequent amplifiers should be adjusted to re-establish the X level output at the headend with the same +10 dBmV at each

SENCORE

Affordable Video Performance

Affordable is a word that is typically left out when you're talking video performance test equipment.

The Sencore VIG791 and VSA794 makes video testing affordable **plus** provides you with these exclusive tests and features.

The VIG791 VITS Generator provides you with 12 special test signals for complete system analyzing including:

- FCC Composite
- NTC-7 Composite
- FCC Multiburst
- 10 Step Staircase
- Modulated 10-Step
- Modulated Pedestal
- Modulated Ramp
- 75% Bars
- 100% Bars
- S/N X/X
- Multipulse
- Linesweep

The VSA794 Cable Analyzer provides you with automated, direct readout measurements of key CATV baseband parameters including:

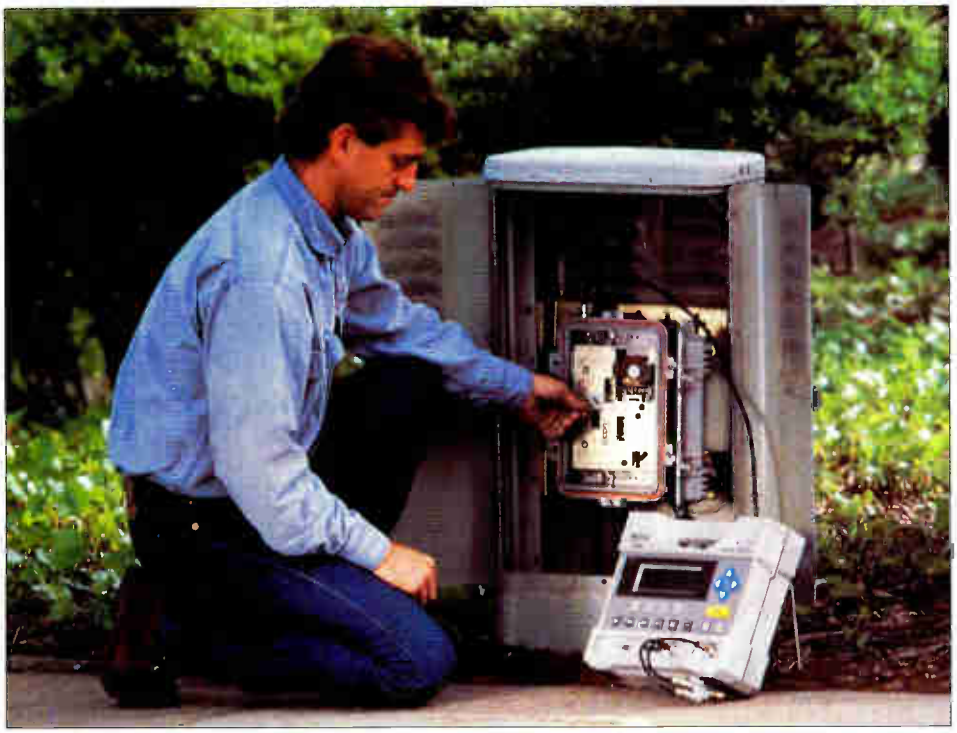
- Differential Gain and Phase
- Chroma to Luma Delay
- Percent Modulation
- In-Channel Frequency Response
- S/N and Hum

TOGETHER - the VIG791 and VSA794 provide everything you need for complete performance testing and troubleshooting. For more information, call 1-800-SENCORE (736-2673) ext. 534

Reader Service 33

Sencore – Your Cable Instrument Connection!

SENCORE
3200 Sencore Drive, Sioux Falls, SD 57107
Direct: (605)339-0100 Fax: (605)339-0317



Return path alignment using the HP CaLan Sweep/Ingress Analyzer.

amplifier input. The amplifier is adjusted using the plug-in pad and equalizer for coarse adjustment and the gain and slope controls for the fine adjustment. The alignment should proceed from the fiber node or first return amplifier out, making sure each amplifier is calibrated properly before moving on.

Again, this may be done with a carrier generator approach, or a sweep system. Care must be taken if using the carrier generator approach because the frequency resolution is limited, and flatness problems may be missed. Once again, it is critical that the proper source levels be used. The level matrix created earlier minimizes the errors in this step.

The successful delivery of interactive services to subscribers is dependent upon the proper alignment of the return path. The key points are:

1) Attention to the alignment process is absolutely critical;

2) Unity gain in the return path is as important as in the forward path; and

3) Good frequency resolution in both the return sweep and spectrum monitoring test gear can help identify many problems before they become customer complaints.

In the November issue, ongoing maintenance of the return path will be addressed.

Table 3: *Source level matrix*

Sweep input level = carrier level - 10 dB = +20 - 10 = +10 dBmV

	Type of hardware			
	Laser hub	Line extender	Trunk amp	Bridger
Sweep input level Internal coupling loss Test point loss	+10 dBmV 4 dB 30 dB	+10 dBmV 1 dB 20 dB	+10 dBmV 13 dB 20 dB	+10 dBmV 13 dB 20 dB
Total insertion point loss	34 dB	21 dB	33 dB	33 dB
Source level	+44 dBmV	+31 dBmV	+43 dBmV	+43 dBmV

Source level = sweep input level + IP = +10 +34 = +44 dBmV

References

1. CableLabs, *Digital Transmission Characterization of CATV Systems*, Nov. 1994.
2. Farmer, James O., Managing the Return Spectrum to Optimize Interactive Revenue Opportunities, *1995 NCTA Technical Papers.*
3. Farmer, James O., Paul Gemme, Charles Cerino, and Mark Millet, Two-Way Cable Plant Telephony and Data Experience, *1996 SCTE Emerging Technologies Proceedings Manual.*
4. Johanson, Brian, Bob Chamberlain, and Aravanan Gurusami, HFC Return System: Management of Subscriber-Induced Noise, *1996 SCTE Emerging Technologies Proceedings Manual.*
5. Kim, Albert J., Two-way Plant Characterization, *1995 NCTA Technical Papers.*
6. Natarajan, Raja, and Paul Vilmur, Providing High Reliability Telephony and Data Services over HFC Networks, *1996 SCTE Emerging Technologies Proceedings Manual.*
7. Paff, Andy, Implications for the Introduction of Telephony Services on the HFC Architecture, *1996 SCTE Emerging Technologies Proceedings Manual.*
8. Prodan, Richard S., Majid Chelehmal, Tom Williams, and Craig Chamberlain, The Cable System Return Channel Transmission Environment, *1995 NCTA Technical Papers.*
9. Staniec, Thomas J., Making it Work: Return Systems 101, *CED,* August 1995.
10. Stonebeck, Dean A., and William F. Beck, Designing the Return System for Full Digital Services, *1996 SCTE Emerging Technologies Proceedings Manual.*

Boston College soars with high-speed modems

Entire campus serves as a model

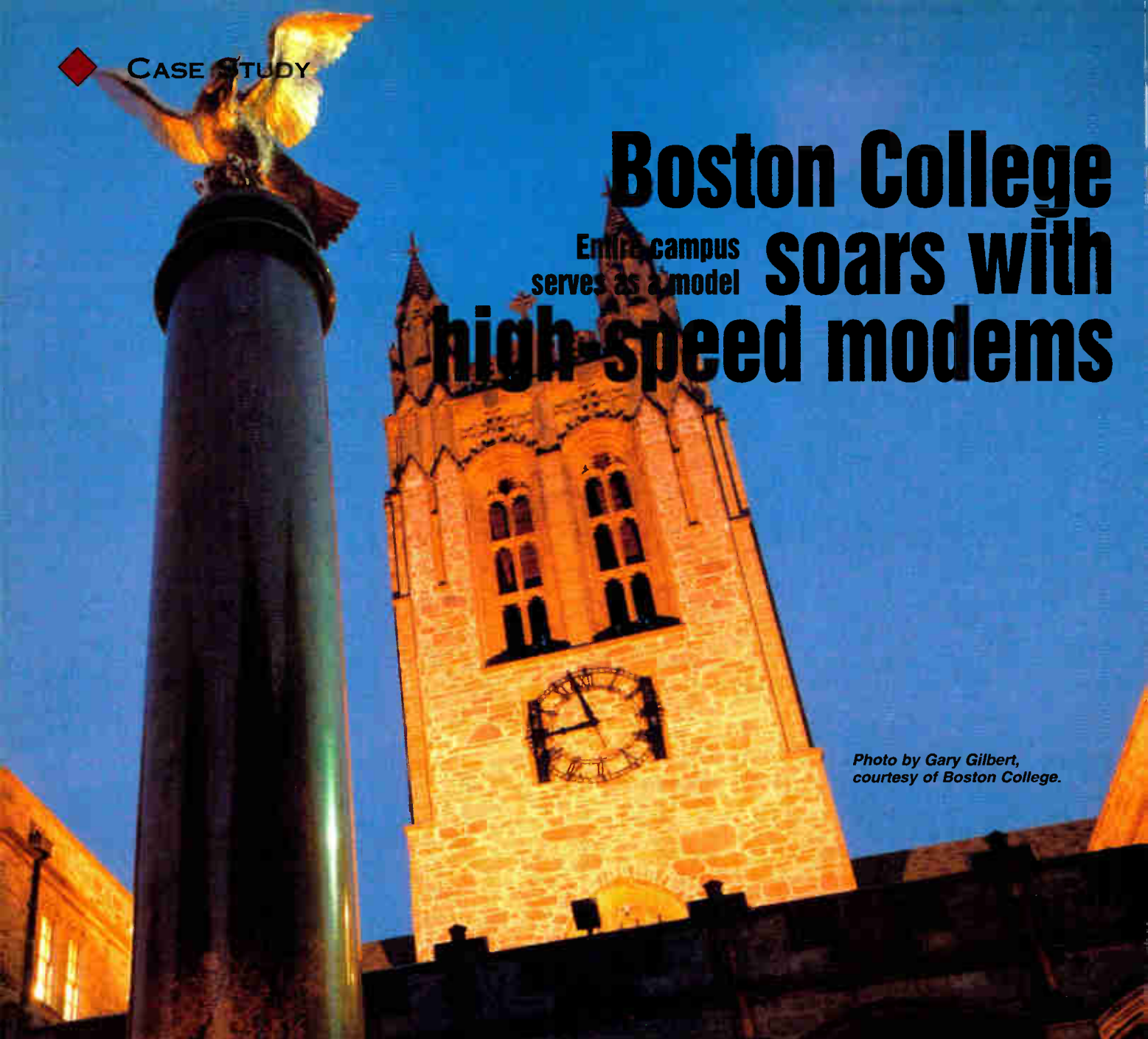


Photo by Gary Gilbert, courtesy of Boston College.

By Roger Brown

Remember when going to college and living in a dormitory meant long hours of study, bad food, a single telephone down the hall and an old TV that pulled in maybe five or six snow-filled channels?

My, how times have changed. Sure, the studying is still necessary, and the food is probably just as bad, but today's students are becoming active participants in the Information Age–and they're bringing their own computers, telephones and TVs to school with them.

To accommodate this new genre of student, colleges and universities around the country are plugging into the global communications network. They're working with local telecom firms to upgrade their services. Some have built their own cable TV networks. And a few more are becoming the new proving ground for high-speed cable data modems.

A case in point is Boston College, which spent nearly a decade planning and designing a new, campus-wide communication system that allows the school to offer its students a spate of new communications features while simultaneously reducing its overhead. With engineering support from cross-town neighbor Continental Cablevision, BC installed a state-of-the-art 1 GHz hybrid fiber/coax network, added a Nortel telephone switch and LANcity high-speed modems and interfaced the whole thing to Continental's ATM-based fiber ring and network control center in Needham, Mass.

The result? A student body that has unlimited, high-speed access to on-line services; a permanent telephone number that follows the student no matter where he lives on campus, along with reduced long distance calling rates; and more than 50 channels of standard cable TV fare and a half-dozen BC-specific channels.

These are important value-added services as BC, a private college, has to offer its students something different in order to stand out in the college-saturated Boston area. "Boston College competes for students, and this is one of the tools," says Mary Corcoran, BC administrator of advanced technology. "The quality of our competition has really gone up, too. We're now seeing kids who have also been accepted by Notre Dame, Princeton and other schools." The upshot is that BC needs to offer just a little more to

keep its classrooms filled with high-quality students.

Expanded greatly, it's the same paradigm telecom network providers are finding themselves in today. "We have a community of 18,000 individuals here, which can be compared to many towns in America," says Bernard Gleason, BC's executive director of Information Technology. "(This network) is a perfect example of the technology and integrated services that will exist someday in communities across the nation."

The "Project Agora" (Greek term for gathering place) network is the brainchild of C. "Jeff" Jeffers, BC's director of network services, a former engineer at Digital Equipment Corp. who was charged with the task of increasing the school's communication network while lowering costs. The project "only took 18 months to build, but five years to plan," says Paul Dupuis, assistant director of advanced technology at the Jesuit school. "This whole thing has been about 10 years in the making."

Network architecture

From the on-campus hub site, which is directly connected to Continental's Northeast fiber ring, fiber emanates to 18 nodes scattered throughout the campus, which in turn feed coaxial runs to "EagleNet" wall plates that are located adjacent to each student's dormitory bed. The project was by no means small: in total, more than 6,000 rooms, 2,500 classrooms and 400 administrative offices were wired for voice, video and data (see Figures 1 and 2 for detail). The approach worked well for BC, where space was at at premium. "We didn't have room for more hardware closets," notes Dupuis. "This approach brought both space and cost savings."

Students access the network via a unique wall plate that has voice, video and data connections. (Photo by Chuck Smith Photography.)

All services run off a Nortel Meridian SL-100 SuperNode SE switch, for which BC wrote software to provide features like voice mail, three-way conferencing, call forwarding, call waiting and malicious call tracing. It's a network many small cities would envy, not to mention other schools.

One of the biggest challenges the school faced was interfacing the network with a wide variety of PCs and Macintoshes, as well as the software that was resident in the machines. "We've had problems with drivers, oddball software and people who weren't very computer savvy," notes Dupuis. So, this year, the school developed a set of minimum standards that student computers must meet to get connected.

For PC owners, BC recommends a Pentium-class processor, Windows 95 operating software, at least 16 megabytes of RAM (24 is preferred) and a hard drive of at least 1 gigabyte in size. Students who need Ethernet cards, cables or other items can purchase them through the school.

Before the HFC network was built, keeping all three campuses connected to the Internet was costing BC $24,000 a year for telephone-based modem lines. By routing traffic from the Newton and Weston campuses through the

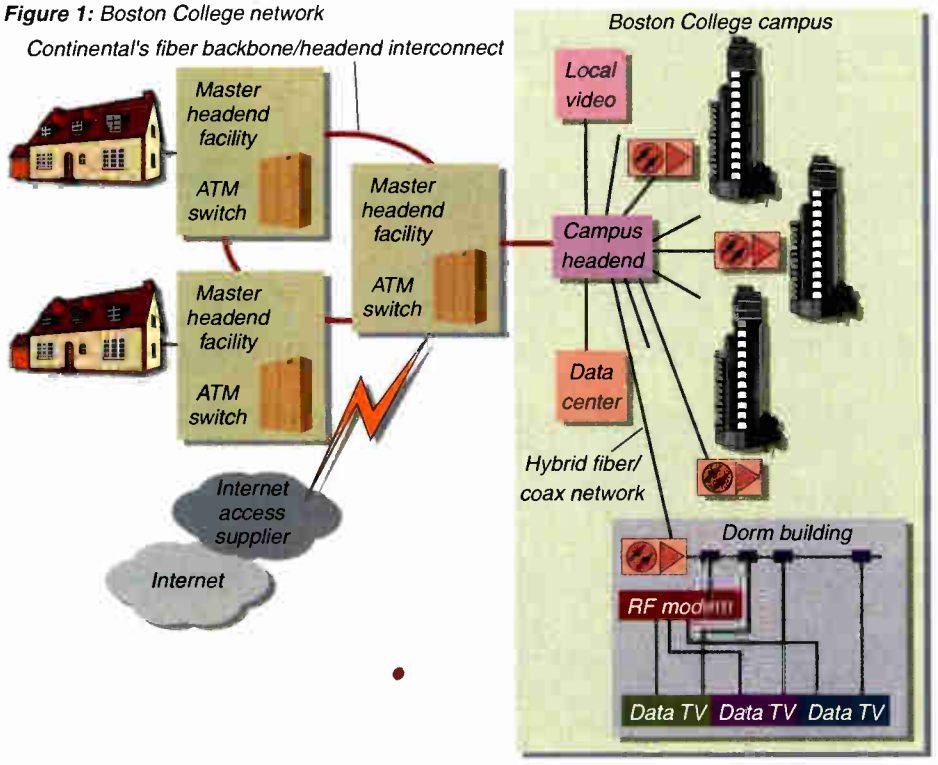


Figure 1: *Boston College network*

main Chestnut Hill facility over the cable network, the school is able to save money even after purchasing the LANcity modems, which list for about $5,000 each.

While the network was primarily constructed to tie the school's three separate campuses together, an important feature is one that allows students and faculty at least telephone access to the network even when they're off-campus. And if they happen to live in Continental's cable-TV service area, they have the added benefit of accessing the network and Internet at high speeds with LANcity's third-generation residential modem.

This type of connectivity, too, helps the school save money. According to Jeffers, BC spends about $80 a month for each phone line in its modem pool. With cable modems, the need for the telephone line is gone.

Phone home–cheaper

But for students and faculty who prefer to use the phone for voice communications, Boston College offers perhaps the lowest rates in the country. The school has leased two exchanges (20,000 total lines) from Nynex,

which is why the school can assign each student a permanent phone number. A dial-up voice response interface to the switch provisions the service, so that students no longer have to schedule installation appointments with Nynex upon arriving at the campus. That means the school was able to connect 2,200 students in three days–a task that Nynex took several weeks to complete. "*That* is customer service," boasts Dupuis.

When it comes to long distance, even Candace Bergen would be impressed: Boston College students pay just 9 cents a minute during nights and weekends, and just 20 cents (22 cents outside Massachusetts) a minute during prime time. BC is able to offer rates so low because MCI and AT&T rebate the school 3 cents a minute for incoming long distance calls and 1 cent for outgoing calls.

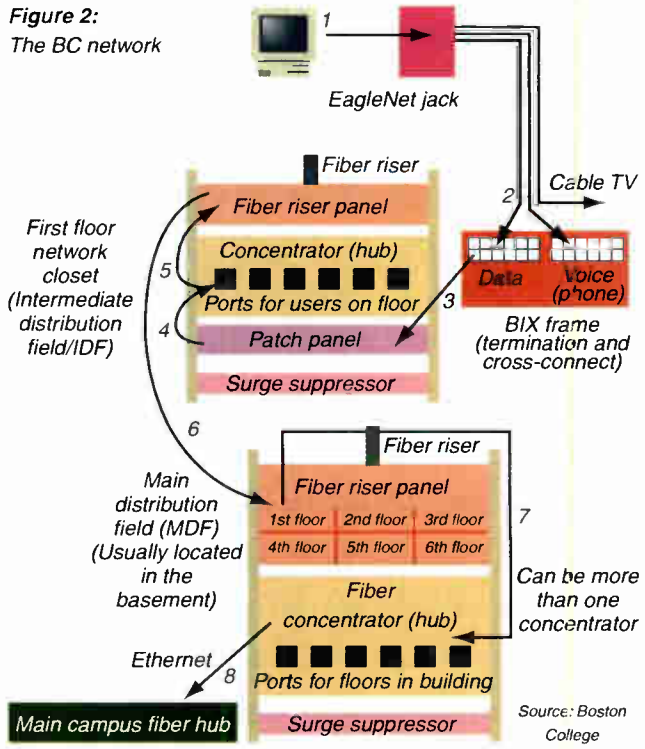
Naturally, the students are taking advantage of both the data and voice plans. E-mail messaging has grown from about 8,000 per day a year ago to more than 35,000 a day. World Wide Web hits have skyrocketed from 150,000 per month to more than 500,000 per month over the same time. On the telephone side, BC has been forced to add T-1 lines to handle the load. "Student calling patterns (are) much higher than research would have shown," notes Dupuis, who also said there has been some blockage on the phone lines because of the demand.

Future plans

Now that the school has its students on-line, where does it go from here? Ultimately, the school would like to extend the service to all its graduate students as well as other schools around the country. As far as technology goes, BC administrators think they already have the model in place to do that.

"It's our opinion that only the broadband cable industry has the infrastructure to do that," says Dupuis. CED

Figure 2:
The BC network



Getting the data bugs out of your system

Crucial tests prepare the path for new services/revenues

By Michael Lafferty

While many cable industry observers are impatiently tapping their feet waiting for the long-heralded roll-out of cable modems, others are swarming over headends, hubs and home drops, testing and measuring to determine if their systems are fit for data communications.

Obviously, each system has its own peculiarities, whether it's due to environment, geography or deployed technology. And, while those peculiarities may dictate special adaptations, there are a number of common factors to be considered and tests that can be run to help determine a network's readiness for data services.

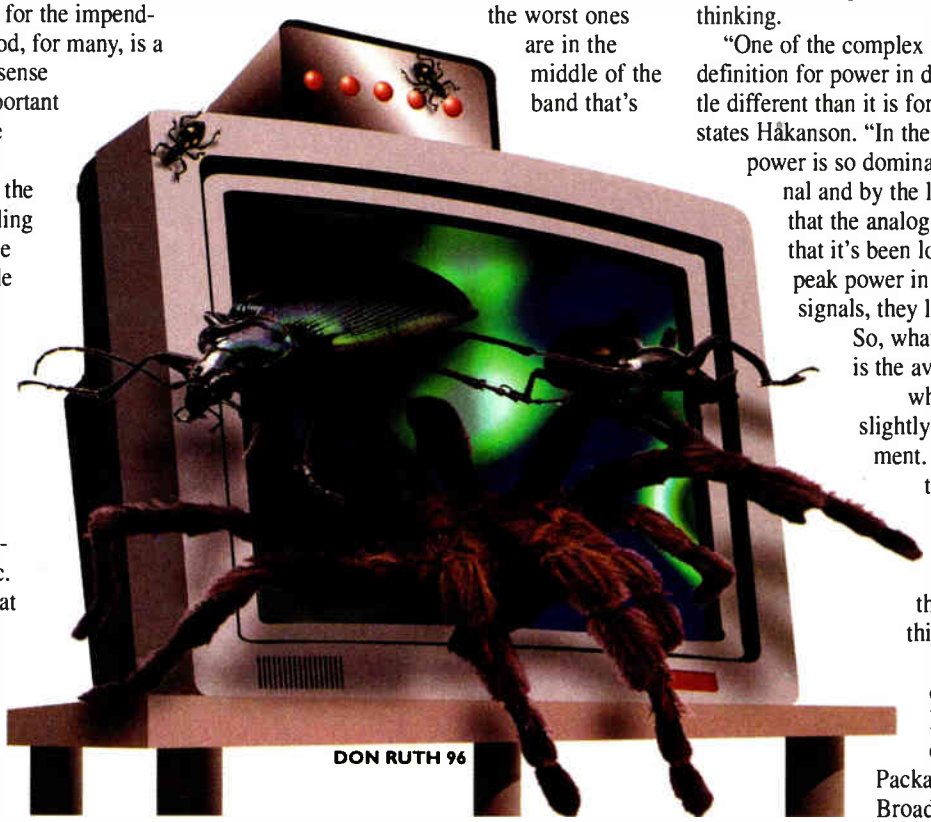
Targeted testing

Preparing today's systems for the impending data communications flood, for many, is a matter of plain old common sense (POCS). But, it's also an important matter of not overlooking the obvious or mundane. While much has been written about the hair-pulling potential of tackling ingress on the return path (see below), there are other trouble spots that need to be tested, monitored and adjusted, on both the downstream and upstream.

In fact, a well-monitored system will put many operators ahead of the game, says Eric Håkanson, product marketing manager, RF transmission test for Tektronix Inc. "You're doing most things that you need to do already. The connectors are tight. You understand how things are working. You've got all the amplifiers balanced right, and your technicians are trained. You're monitoring things. That takes care of at least half of the problems in the downstream, if not three-quarters."

Common path distortion, in-channel frequency response, group delay in plant and composite distortions–CSO, CTB and XMOD –need to be addressed as well. Composite distortions, says Håkanson, have a tendency to be overlooked when adding new services.

"Most people probably have a pretty good handle on it from the analog standpoint because they've made measurements there already," states Håkanson. "But when you're adding new services, you're using a different part of the spectrum (and) you might not have bothered measuring there. So you need to make sure you don't have funny distortion products up there. Normally, the worst ones are in the middle of the band that's being used. So it's probably not a problem, but it's a good thing to go check to make sure."



DON RUTH 96

Sweep alignment, while less of a consideration in HFC systems because of shorter amplifier cascades, should not be overlooked either. Laser headroom is another factor to be checked, especially when new signals (and hence, more signal power) are being added. Håkanson points out that a system's available bandwidth needs to be examined as well.

"You might have put in a 750 MHz system, but you're only using 500 MHz," says Håkanson. "And you may have maintained the plant for five years thinking, 'Oh it's 750 MHz.' But, lo and behold, you've got some amplifiers out there that aren't anymore. You need to spot check it to make sure nothing has degraded. It's not a big problem, but it's something to be aware of. And checking it as you're rolling out a new service makes a lot of sense."

Characterizing the transmitters in a system, both for the headend and customer unit, is another vital area of concern. Determining how much output power there is and its range is important when deploying new services like digitized data communications, says Håkanson. But, defining power in a digital environment requires some adjustment in thinking.

"One of the complex things here, is that the definition for power in digital channels is a little different than it is for analog channels," states Håkanson. "In the analog channel, the power is so dominated by the carrier signal and by the level of the sync tips that the analog video goes through, that it's been long defined as the peak power in the carrier. In digital signals, they look more noise-like. So, what you really care about is the average power over the whole channel. It's a slightly different measurement. And one of the things that you've got to get used to is that you're comparing peak and average, and those are different things."

These types of considerations, says Daniel Leith, support engineer for Hewlett-Packard's Interactive Broadband Program,


980 nm EDFA Pump
GRATING STABILIZED
THIS SALE $
MILLIWATTS
PRICE PER MILLIWATT $
Super High Power
125mW
High Power
100mW
Coolerless Power
70mW
Full service pumps.
The highest performance EDFAs are powered by premium pump lasers from SDL Optics.
SDL®
Reader Service 37
Start designing your transmission systems with more power.
Call us to find out how: (604) 544-2244
SDL Optics, Inc., 6703 Rajpur Place, Saanichton, BC, Canada, V8M 1Z5 Fax: (604) 544-2244

require cable professionals to acquire a new perspective. "Digital levels," says Leith, "take a whole new mindset in terms of test equipment and test equipment knowledge for digital signals. You can't just pick a spectrum analyzer and look at a digital level next to an analog television level. It's not like that at all. It can be rather tricky. You basically have to have test equipment that will measure digital power."

Ingress distress

By far, the biggest hurdle in data communications deployment is the troublesome return path. And, while the unpredictable in-home environment has taken most of the heat on the matter, Jim Harris, marketing manager for Trilithic's Instruments Group, thinks the blame also lies in cable's lap.

"It feels good to the cable industry," says Harris, "to say it's all the bad guys in the home that do it. Ingress gets into the system because of the wiring we put in. What this all comes down to is that the ingress gets into the system in the home because houses are noisy, and hand-flexible RG6 just doesn't have near the shielding coefficient that hardline does."

Regardless of who's to blame, return path ingress (including impulse noise, microreflections, group delay, etc.) is a hard fact to deal with, no matter how well a system is tested and monitored over time. Harris points out that before dealing with it, a point of reference or standard of performance has to be established. With downstream analog signals, the point of reference imposed by logic and the FCC, notes Harris, is the back of the subscriber's set.

Figure 1: Tektronix's 2715 spectrum analyzer gauges desirable/undesirable (D/U) signal ratio on a digital channel.

"For the return path," reports Harris, "the point is to provide a clear enough RF signal to an RF modem in the headend. The quality measurement is always there at that modem. The object is to deliver the right signal level, with the average digital traffic, 20 to 25 dB signal-to-noise. So everything that's done in the field actually needs to be referenced to how it ends up being measured in the headend."

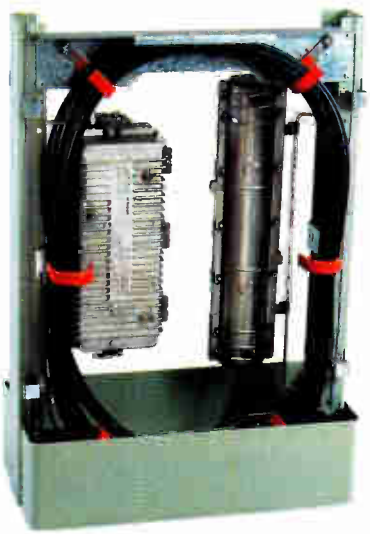
There are a variety of ways to measure and pinpoint return path ingress, but most are based on using a spectrum analyzer. A number of vendors, including Tektronix, Wavetek, Hewlett-Packard and Trilithic, have developed dedicated equipment or testing systems to accomplish the task as economically as possible.

"Sometimes," says Steve Windle, product marketing manager at Wavetek Corp., "what people do is just use a portable four-carrier generator in place of a sweep generator and the spectrum analyzer out in the field (see Figure 2). But the problem with that is that it doesn't give them all the information, all of

MOORE FIBER NODE CABINET

Moore engineers worked closely with experienced fiber installers to design our Fiber Node Cabinet to perform in real world conditions. Today, Telecommunications companies including CATV, Telephone and Data use the Moore enclosure with confidence because of the design effectiveness, quality construction and long term durability.

- **360° access for equipment installation and fiber optic cable storage**
- **multi-point locking doors for separate access to cable storage and equipment compartments**
- **accurately positioned hardware to support equipment and stored fiber coils**



- **heavy gauge steel construction for rugged field service**
- **durable polyester coatings in 3 colors over galvanized steel for exceptional durability**

MOORE

Reader Service 39

MOORE DIVERSIFIED PRODUCTS, INC.

1441 Sunshine Lane • Lexington, KY 40505 [illegible]

the frequency response data. It just gives them four specific points in the response. If there is rolloff in the diplex filter, there could be a suck out, maybe in the response. It's possible it could not be seen if they're using a carrier generator method."

Modems help relieve distress

As each cable system has its own peculiarities, so do cable modems. In fact, deciding which cable modem to deploy can depend a great deal on the system itself and how well the staff is able to clean up the return path. The modems themselves have the ability to assist in the cleanup effort as well.

According to Rouzbeh Yassini, president and CEO of LANcity Corp. (which was recently acquired by Bay Networks for $59 million, see page 12), his company's third generation modem includes a great deal of automatic correction capability.

"We have a closed loop," says Yassini. "Our system transmits a signal to the headend, and it comes back to the unit. The entire forward and return paths get corrected with whatever correction needs to be done by comparing the field modem with the headend modem. Our system aligns and adjusts each modem specifically. For instance, if one modem has -5 dB tilt, another one has +20 nanosecond group delay, and one has 0.5 microsecond microreflection, the specific correction will be made on that path for that problem."

Richard Rommes, network engineering and operations manager for Cox Communications in Phoenix, Ariz., says the LANcity modems also have an important capability to adjust power levels accordingly. And, while the modem's closed loop adjustments are valuable, he says he still has to deal with "interference that literally washes across the entire modem signal."

But, even in this effort, Rommes says the modem's open standard SNMP interface provides valuable assistance. "What we've found," says Rommes, "is that your typical cable industry plant staff don't have the sophisticated monitoring equipment in place to be able to look at things like noise. But, we've also found we can just throw a modem out there, and I can send packets to it and monitor it from our workstation because I use industry standard SNMP queries. I can ask it to tell me what the dB levels are, etc.

"The problem is that there are no real tools out there today that I've seen, and please correct me if I'm wrong, that you can just put on the network and say, 'Monitor this frequency and tell me the percentage of times you've seen noise and what those levels were.' But the modem does that inherently by design because it basically counts packets for you and tells you whether they're garbaged or not.

"Our test now consists of cleaning it up the best we can using the tests that we've got. Get me carrier-to-noise at this level. Get me dB levels this high at all the different points. If it passes by these tests, we put a modem out there. I can look at it remotely. I can sit there and watch it for a day or two. And I can actually chart the noise that it sees on the interface."

The SNMP queries, explains Rommes, are products of a polling function that's generated through the system's network management platform to monitor certain "counters." The "counters" are called MIB (Management Information Base) objects and can be accessed and manipulated through a variety of industry standard applications that, depending on the computer system involved, can range from $400 to $2,000. Rommes says some of the apps are even available on the Internet for free.

Jeff Boyer, lead line technician for Cable Co-op in Palo Alto, Calif., says his two-way capable, all-coax system, which is awash with noise from radio traffic from the San Francisco Bay area, is using another modem configuration in its ongoing test. "That sub-band area," says Boyer, "just gets murdered by different kinds of signals. Right by the San Francisco Bay there's a ship-to-shore radio station, and it operates at 13 MHz, 17 MHz and 22 MHz. And it just blasts into our cable system big time.

"Most cable modems use 6 MHz bandwidth. The one we're using, with Com21 technology, uses a 750 kHz bandwidth. So we can fit it in between the ingress. And that works pretty good for us."

"In fact," he continues, "our deepest cascade is 26 amps, and it's working fine. People just can't believe that. But, with this technology, it's so cool because you can fit it in between where you have problems."

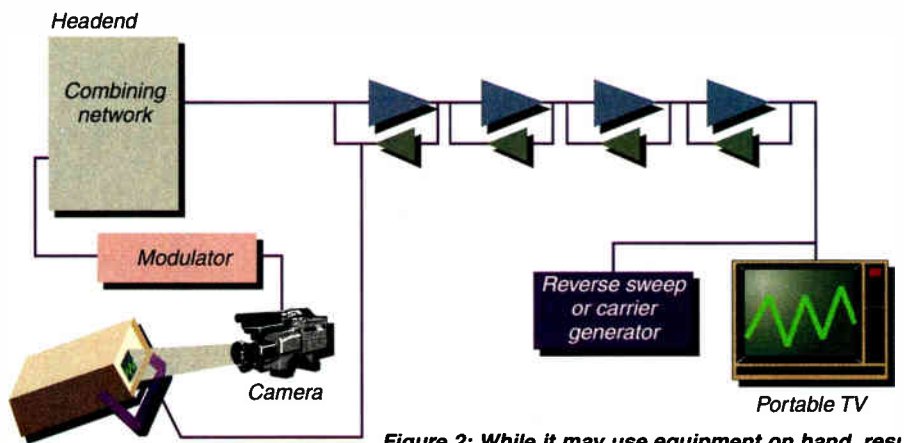
Boyer reports Terayon Corp. also tested its modem in his system for about six months. While it had a 6 MHz bandwidth, it also had the capability to handle narrow bandwidth ingress. He says even though he put it "in the nastiest part of the spectrum...it didn't have any problem."

Tap every resource

While no testing program is perfect for prepping a system for data communications, continuing advances in test and measurement and cable modem technologies have changed the picture for a growing number of operators. Many equipment vendors, both T&M and modem, who obviously have a vested interest in cable's success, are actively involved with their clients in helping them develop testing systems for data communication services.

While it's no skin off his back whether cable clients tap his or another company's expertise or resources, Trilithic's Harris cites a cautionary note to those who are hesitant to utilize every resource available. Those who would go it alone, says Harris, may get left in the dust.

"Oddly enough," notes Harris, "the Bell companies have been more receptive than cable companies to the idea of coming out and kind of partnering up to work up a test regime. That's because they're more centralized in the way they do business, I guess." Harris says he's been working with an RBOC engineering chief for the past couple of days, "and his willingness to work side-by-side with suppliers to solve his problems is always striking." CED



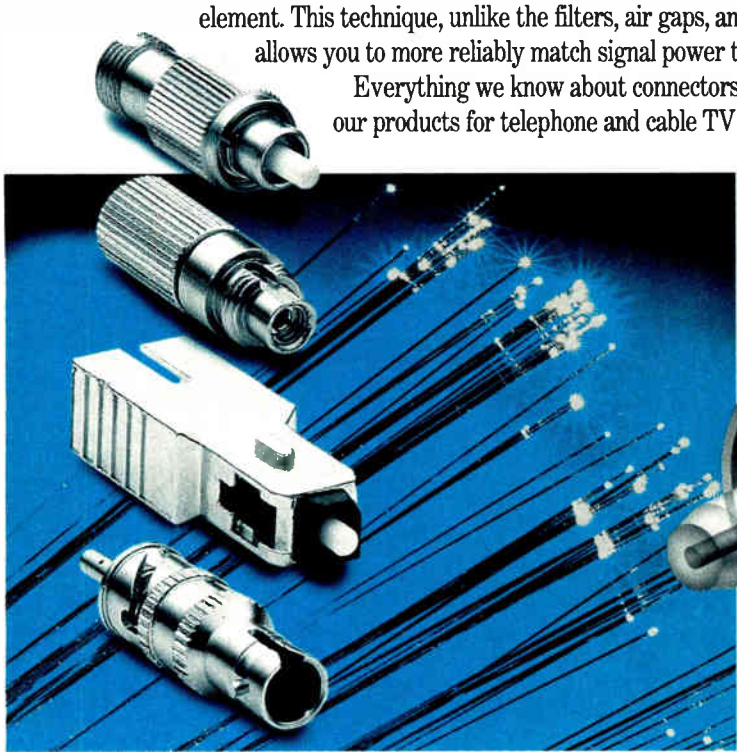
Source: Wavetek Corp.

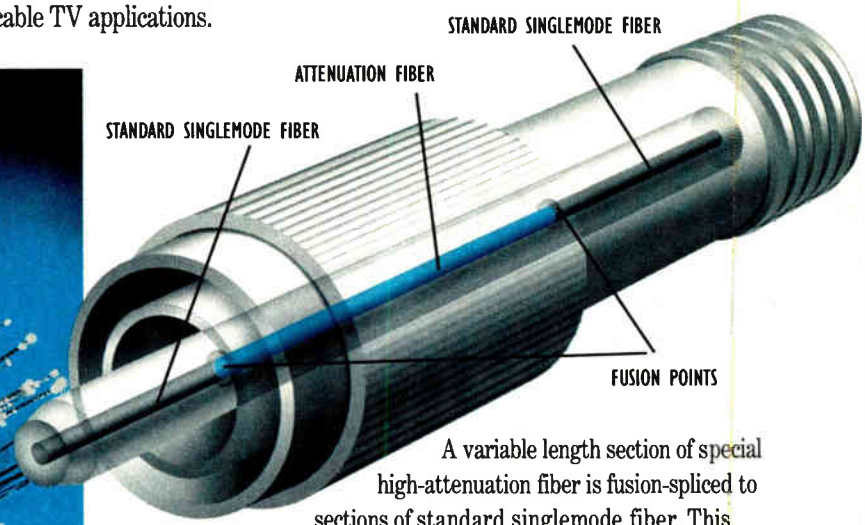
Figure 2: While it may use equipment on hand, results from such testing arrangements as this can be expensive, cumbersome and incomplete for data services.

- Designed to meet Bellcore GR-910
- Build-outs, bulkheads, and in-line types available
- Precise values for narrowcasting
- Uses industry standard ferrule

For consistent performance and low reflectance, our attenuators are fiber to the core.

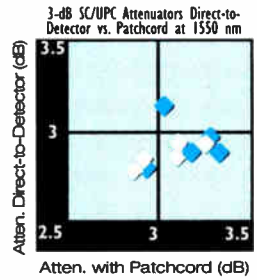
For less signal-scattering reflectance, AMP Build-Out Attenuators use a patented, all-fiber attenuation element. This technique, unlike the filters, air gaps, and core mismatches used by other products, allows you to more reliably match signal power to receiver dynamic range in optical fiber runs. Everything we know about connectors, fiber optics, and manufacturing goes into our products for telephone and cable TV applications.





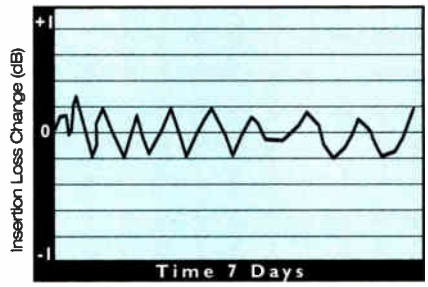
A variable length section of special high-attenuation fiber is fusion-spliced to sections of standard singlemode fiber. This reduces reflections, minimizes cladding effects, and eliminates epoxies from the optical path. It also allows connectors to mate to standard fiber.

- Standard values of 3, 5, 10, 15, and 20 dB
- Also available in 1 dB increments as low as 1 dB
- Reflectance: ≤ -45 , -50, -55 and -60 dB
- Temperature Range: -40°C to +85°C
- Vibration resistance: ≤ 0.1 x attenuation
- FC, SC, ST and D4 style connector interfaces
- PC, SPC, UPC and APC end finishes
- Polarization insensitive



Consistent attenuation is achieved either with patch cables or when connected directly to the detector. The attenuator element does not strongly guide cladding modes that would produce different loss values when connected with or without a patch cable.

The absence of epoxies and index matching materials in the optical path results in more stable and rugged devices. Change in loss over the specified temperature range is shown.



AMP is a trademark.

Connecting at a HIGHER level.™

For more information, call 1-800-220-5489 (fax 717-986-7321). AMP Incorporated, Harrisburg, PA 17105-3608. In Canada, call 905-470-4425. On the Internet, http://www.amp.com

Reader Service 40

AMP

Designers pour 'smarts' into digital test gear

Finding a way to put a Ph.D. in a digital box

By Dana Cervenka

While the cable industry's engineers are eager to make the transition from analog to digital transmission in their systems, affording the opportunity to offer superb audio and video quality, as well as a host of new, advanced services, it's not without a bit of trepidation that they take the first steps from the familiar, comfortable world of analog testing into the big unknown that is digital.

Adding to this anxiety is the nagging suspicion that until digital services are actually deployed in a meaningful way in cable systems, operators may not have a full understanding of which tests will be the most significant.

"Customers are asking for power, bit error rate (BER), carrier-to-noise (CNR), carrier-to-ingress on the active return, power on TDMA signals, SNR vs. CNR (how close are you to the end of the cliff?), and others," says Bruce McPherran, marketing program manager, Hewlett-Packard. "We suspect that this over-testing is out of fear of the unknown. As industry confidence grows, testing will consolidate and simplify."

That fear of the unknown seems to be well-founded, for the time-being. In the case of digital video measurements, there are a number of challenges facing operators, according to Sencore Inc.'s cable product marketing manager, Brad Johnson, including the sheer width of the digital signal (a full 6 MHz), as well as the multiple digital modulation formats at work in the same system.

What's more, the digital system also utilizes multiple layers of signal processing in both the transmitter and the receiver, which hides "the true quality of the video at different test points in the cable system," says Johnson. Capping off these challenges, techs will have to be able to reconstruct the picture from data fragments that are scattered throughout the data stream in order to find out how good the customer's picture quality really is.

And currently, there are no omniscient test devices in the marketplace. "There doesn't appear to be any one instrument that will test all of the layers of a digital video system," adds Johnson. "Those that provide a majority of the essential tests are very expensive, and may be cost-prohibitive to outfit field technicians with."

For test equipment manufacturers who choose to be all things digital to all people, the problem is finding a way to design test equipment that can handle multiple standards, a "non-trivial" task, says Eric Håkanson, product marketing manager, RF Transmission Test, with Tektronix Inc. Using data services as an example, he explains, "Compare any two cable modems. Maybe they both use QAM (quadrature amplitude modulation), but they might have different error correction. They might have different signalling protocols. There is an entire level of (design) that you have to do to be able to make the bit error rate tests."

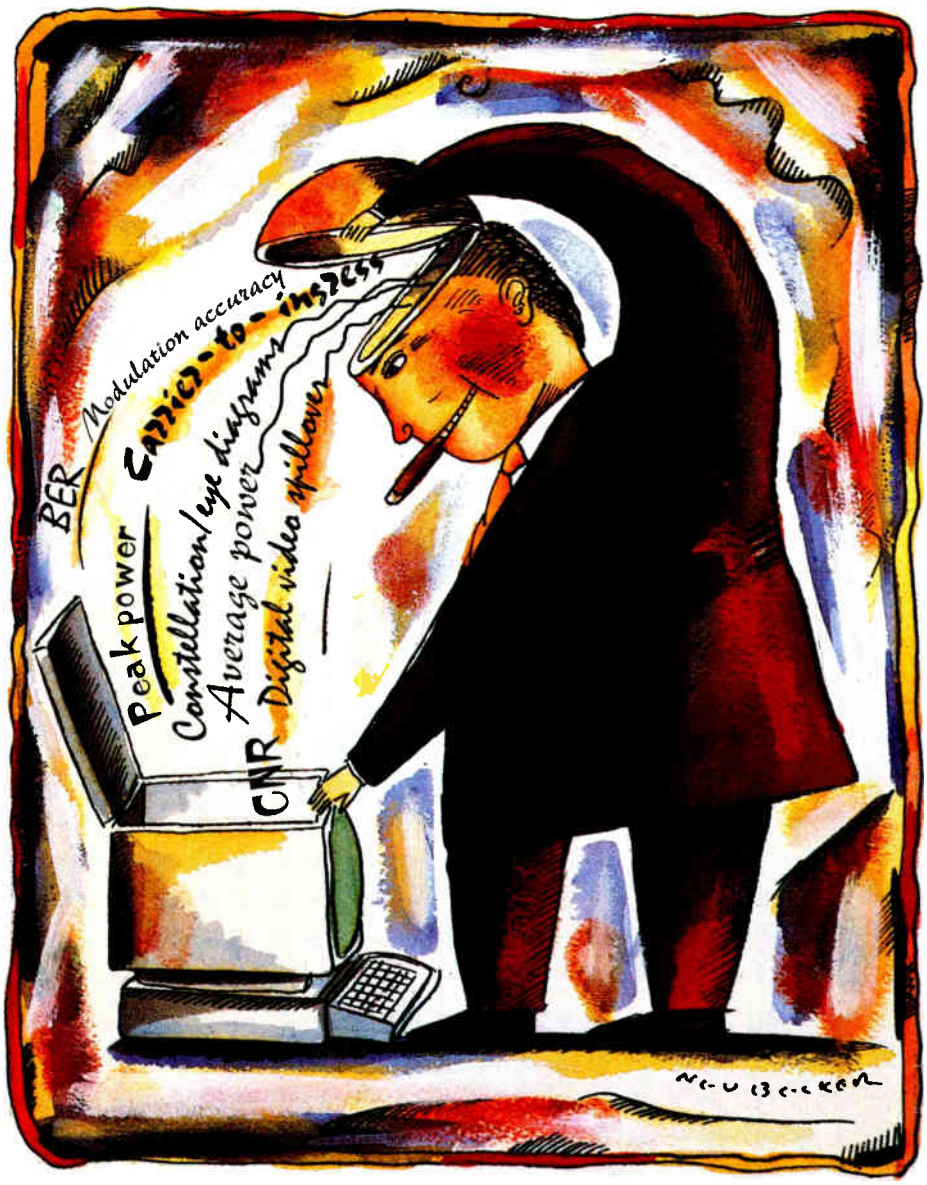


ILLUSTRATION BY ROBERT NEUBECKER, SIS

Searching for tools

Given these obstacles, many manufacturers are searching for ways to optimize test equipment for specific digital testing applications, while simultaneously figuring out a way to pour knowledge of testing and interpretation from the brains of a select few designers into

Finally, Total Return Path Maintenance For 2-Way Distribution Systems

When equipped with the Multiplexer Option, the 9580SST accepts signals from up to 8 separate test points and analyzes sweep & ingress from each individually, returning data to as many as 6 SSR field units (A thru F) connected to it.

Announcing the Trilithic 9580 Sweep and Ingress Monitoring System

More Than A Return Path Sweeper
Displays sweep response, calculates gain and tilt, and measures return path ingress and noise.

Fast and Convenient
Updates all measurements approximately twice per second.

Versatile, Cost Effective
One headend unit supports six field units, and with no loss of speed.

Detailed Troubleshooting Data
One headend unit can monitor up to eight return test points individually.

For more information about the Trilithic 9580 Return Path Maintenance System, or Trilithic's full line of Broadband Test Equipment, dial

1-800-TRILITHIC

http://www.trilithic.com

Reader Service 41

HP CaLan's 3010R and 3010H

include digital channel averaged power; desired-to-undesired signal power ratio; adjacent channel leakage; and digital channel triple beat and second order distortions.

Hewlett-Packard is offering the HP 89440 Vector Signal Analyzer to conduct digital video modulation analysis, while the manufacturer has built digital carrier power measurements as standard features into the HP CaLan 8591C, as well as a number of other pieces of its test equipment, including the 3010R field unit and 3010H headend unit (pictured above).

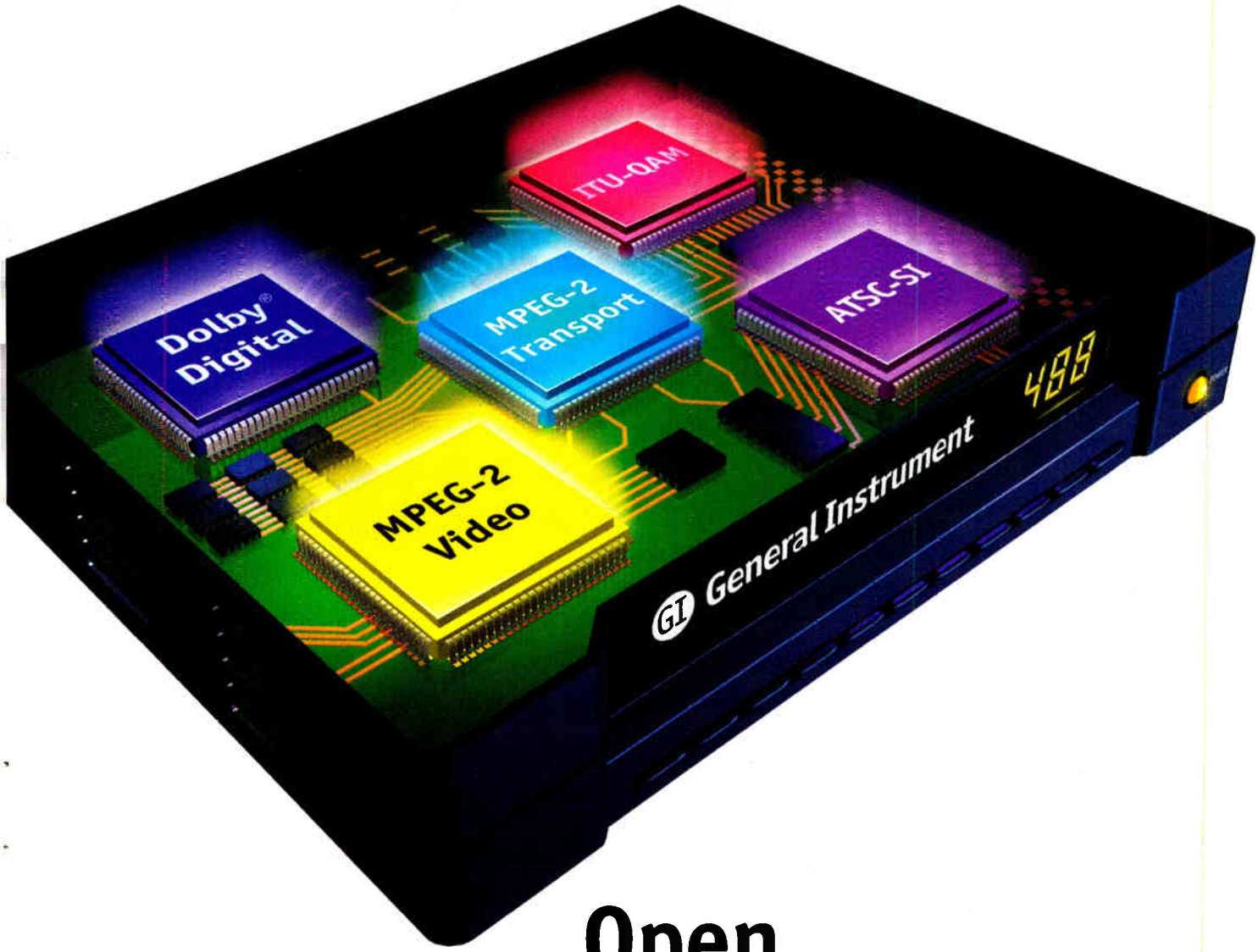
HP's IDACOM Telecom Operation is working with other groups within HP to produce digital test equipment, and to add to the industry's collective knowledge, is offering up handbooks from its Digital Video Test Symposium.

Likewise, Johnson notes that Sencore's present products do support the tech's need to measure the digital signal level or power of the signal. ComSonics' offerings currently include tools needed to monitor the physical layer, such as signal level meters.

Tightening up the plant

While there's lots of talk about the potential of ingress and reflections to degrade digital signals, not enough attention has been paid to system integrity as a whole, says ComSonics' Zimmerman. "Plant reliability and the reliability of individual electronic components, power supplies and other such equipment will dictate the effectiveness of our systems in the future," he explains.

Preventive maintenance will become even more important with the advent of digital transmission, says Jim Harris, marketing manager for Trilithic's Instruments Group: "The way you deal with a cliff is, you put a fence at the top, and an ambulance at the bottom. The fence is preventive maintenance; the ambulance is performance monitoring." To that end, Trilithic builds equipment that can be set up to conduct continuous monitoring of ingress and



Open. For Business.

GI's MPEG-2 digital solution combines open standards with advanced system security

General Instrument understands your need for equipment interoperability and flexibility. That's why we based our digital cable system on the industry's most advanced open standards. MPEG-2 Video. MPEG-2 Transport. Dolby Digital Audio ATSC System Information (SI). ITU Trellis Coded QAM/FEC Modulation. GI's MPEG-2 digital solution supports them all.

Partnered with our adoption of these open standards is our field-proven security system technology. GI maintains a state-of-the-art access control and encryption system to offer you the most secure network possible. This system is licensed to other manufacturers, providing true interoperability.

So, for the most advanced, flexible, and secure digital cable system available today—and tomorrow—choose the GI MPEG-2 digital solution.

It's open...for your business.

Reader Service 46

GI General Instrument

(215) 674-4800 (worldwide) • (800) 523-6678 (toll-free in U.S.) • (215) 675-4524 (fax worldwide) • Visit our Web site at www.gi.com

Anritsu Wiltron's Cable Mate

noise in the troublesome return path–essentially, it's a digital spectrum analyzer that also does test signal analysis.

Ken Harvey, product marketing manager with Anritsu Wiltron's Microwave Measurement Division, agrees that cable operators will have to pay much closer attention to the integrity of the physical plant. To that end, Anritsu has introduced an analysis tool called Cable Mate, designed to test coaxial lines for glitches that can wreak havoc with digital signals. The product, essentially a frequency domain reflectometer (FDR), combines the capabilities of a network analyzer and a bench sweep, says Harvey. Unlike a TDR, which uses DC pulses, the FDR technique uses RF frequencies. An FDR finds RF impedance problems vs. distance in a "Distance-to-Fault" display. A technician could use it at the curb to search for homes where cheap splitters and low-grade cable have been installed, without having to actually enter anyone's home. While Harvey notes that a network analyzer can be used for the same application, the Cable Mate is designed to be portable (it weighs about 2.2 pounds).

The return path is the site of a hornet's nest of problems which may be difficult to isolate. Harvey relates the story of one engineer at an unnamed digital trial site who discovered that by plugging and unplugging the coaxial line from the coaxial drop distribution node, he could get his reverse channel working again. Initially thinking the problem was with the connector, he later discovered that the fault was a software bug in the set-top that caused it to freeze up; by disconnecting and reconnecting the coax, the engineer effectively caused the set-top to reinitialize, and reconnect.

One group working on tools for testing the return path is CableLabs, which has developed

Tektronix Inc.'s 2715 Cable TV Spectrum Analyzer

the CW Tester, a carrier wave testing device designed to analyze upstream digital transmission performance (see "LabWatch"), page 26.

Ph.D.s in a box

Though the transition to digital may be rocky, test equipment manufacturers say that there will come a day when digital testing will be, if not easier than analog testing, at least no more difficult. "We don't want techs to have to be digital communications experts to make it through the day," says HP's McPherran. "Digital test equipment will evolve to do much of the diagnosing that is currently done by the operator. It will be much smarter and more user-friendly—i.e., a Ph.D. in a box."

Using constellation diagrams as an example, Tektronix's Håkanson notes that today, few people in the industry understand digital modulation well enough to be able to look at the diagram and figure out what's going wrong with the signal. "Two things will happen," says Håkanson. "In the short-term, we will get people trained to recognize things. And over time, the instruments will get smarter.

"I don't know of anyone who's working on this, but an interesting thought would be a piece of test equipment with an impairment classification button that says, 'Oh, you have this,' based on the way the constellation looks." Håkanson qualifies that the design of that type of feature would be an epic research project, given that there's rarely a single cause of an impairment.

Realistically, how far down the road is the availability of user-friendly, smart, digital test equipment? "When the standards are set—Take that length of time and add a year or two," says Håkanson.

McPherran agrees that some sort of industry consensus will be critical. "We don't believe that test equipment manufacturers can deliver well-targeted solutions until the dust settles," he notes. In the meantime, as operators begin to roll-out digital services, they are no doubt compiling detailed wish-lists for what they want in their smart, new digital test equipment. CED

digital cable now...

...from Pace

Digital cable is here. And while others talk, Pace acts.

Our digital cable set-top solutions are available now. We already mass-produce digital satellite receivers for leading world broadcasters.

Our QAM technology is completely MPEG2 compatible and available in end to end applications with many leading conditional access systems.

So stop talking digital cable. Start acting - with Pace.

PACE

The One To Watch™

For more information contact Ian Ward on +44 1274 537086 or e-mail ian.ward@pace.co.uk

Offices in: *Australia • Denmark • Dubai • Germany • Hong Kong • Indonesia • Italy • Mexico • Norway • South Africa • Thailand • USA*

Pace Micro Technology plc, Victoria Road, Saltaire, Shipley, West Yorkshire BD18 3LF, England. http://www.pace.co.uk

Reader Service 48

The five big headaches of cable telephony

Powering tops the list of challenges

PHOTO BY UNIPHOTO

By James Careless

Making cable telephony work: it's enough to give an engineer a splitting headache. That's because taking cable telephony from theory to reality means jumping a number of technical challenges, each of them demanding and daunting. So which of these are causing the worst migraines? We asked some of the broadband industry's leading engineers for their thoughts.

Powering

The biggest technical issue, based on what the engineers we spoke said, is powering: how to supply the cable network with sufficient electrical power to support cable telephony.

That's because "We've got to mount telephone modems on the side of homes," says Alex Best, senior vice president of engineering for Cox Communications. "Those modems have to be powered, and in return, those modems power the telephones inside the home.

"So first of all, you have to make a decision as to whether you're going to premise power–have consumers power this box and their own phones–or whether you're going to network power, meaning power it down your network as the telephone companies do," Best continues. "I believe you will find that most MSOs, after much gnashing of teeth, are going the network powering route."

Going this independently-powered route–as opposed to linking the network to the main utility grid, and failing when it does–is essential, says Best, because people are accustomed to relying on their phones working when power is down.

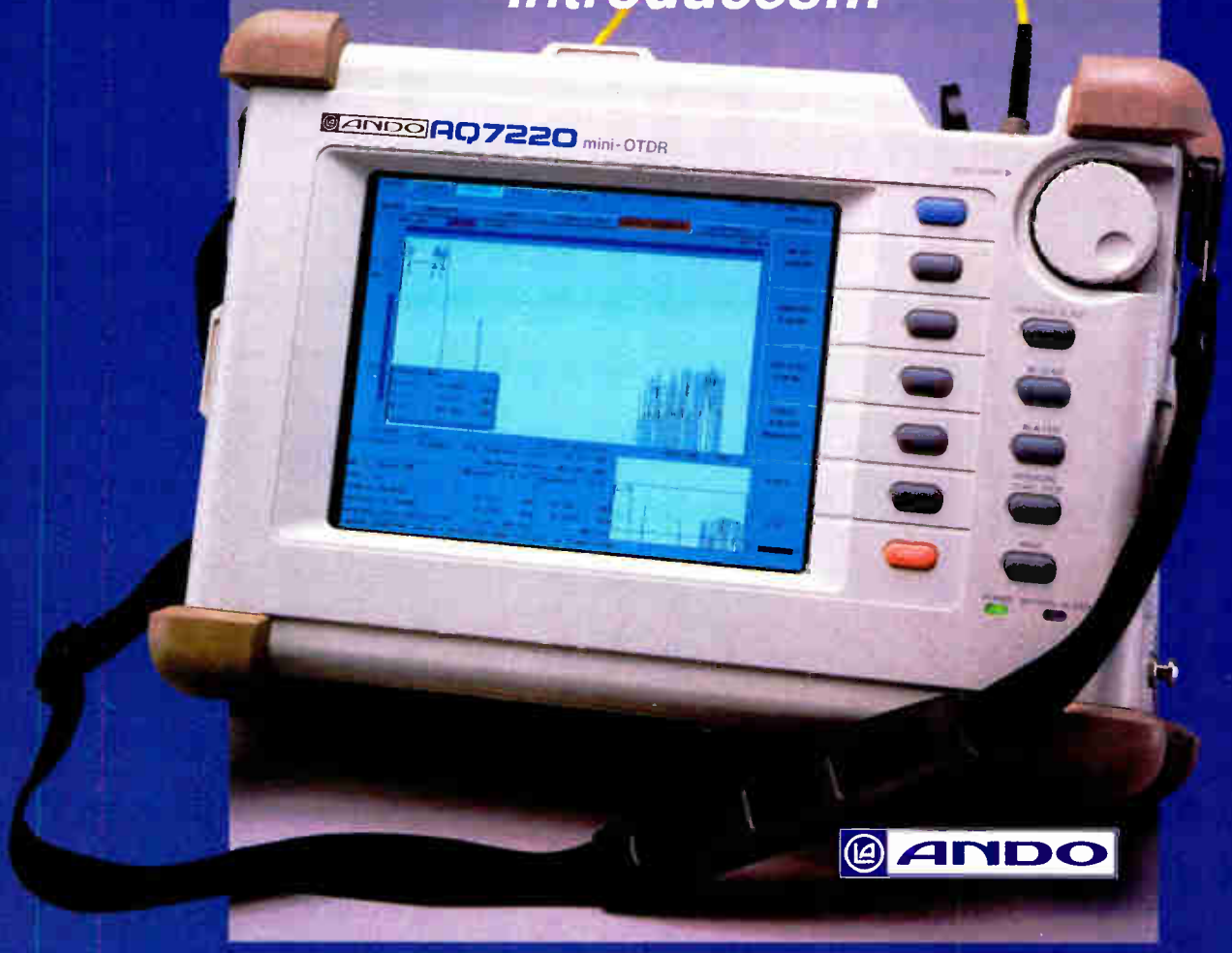
"In order to do that, most of the MSOs are converting their powering systems to what we call central node power, which means the network, the box on the side of the home and the phone inside the home are powered from this power supply, which, in return, upon loss of the power company's power, instantaneously switches over to a battery backup scheme. (That) switches over to a gas-driven generator, if the power outage is longer than an hour."

This power supply is patched into the existing hybrid fiber/coax network at various strategic points to provide an overall level of powering throughout the system. This approach maximizes power output while reducing line loss, and avoids overloading part of the network by pumping it with too much voltage at any one particular point.

The problem here, of course, is that all this extra power supply wiring has to be added to existing networks, and that the central node power supplies, with their backup generators, have to be installed as well. And they are

Amphenol®
Fiber Optic Products

Introduces...



The Portable OTDR

Designed to ISO 9001 quality standards, the 909 Series portable OTDR was developed by Ando Corporation utilizing years of technical experience with field-proven OTDRs. The unit offers excellent performance and a wide range of features, including: single button operation, a "Windows-like" user interface, an overview trace window, an easily readable 7" VGA LCD and a high dynamic range of 31 dB/29 dB (1.31/1.55 um). Portable operation is made simple with a user-interchangeable multimode module and the readily available 12-volt "cam corder" style battery. Its compact design makes this OTDR ideal for use in the plant or in the field.

Registered Firm
ISO9001/QS9001
Certificate QSR-273

Call toll free
1-800-944-6446

Amphenol
Fiber Optic Products
Illuminating the world of fiber optics™

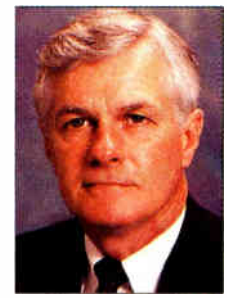
Reader Service 49

"massive," says Best. "These things are large. We have to get permits to install them. Nobody wants them near their residence, and they're expensive." How expensive? "We've budgeted $20 (per) home passed to convert over to central node powering."

If this weren't enough, "This total concept is complicated by one other thing," Best notes: "You have to make an upfront decision on what your expected penetration of telephony is."

That's because "this power supply and this generator are powering two things: the active amplifiers in the system, which don't change over time, and the boxes on the side of the home, which in turn power the telephones. And so the power capacity needed per node is going to vary depending on whether you have one percent or 50 percent telephony penetration."

Best adds, "We at Cox have decided to start initially with a powering system capable of handling 20 percent telephony penetration. Under those conditions, the generator used is in the neighborhood of a 5-7 kilowatt generator."



Alex Best

Reliability

The whole powering issue goes to the heart of the second big challenge of cable telephony, namely, delivering service reliability that equals or exceeds that of existing telcos. The problem here is that people believe, rightly or wrongly, that telephone systems are much more reliable than cable, says Pete Smith, vice president of engineering at Rifkin & Associates (which has 320,000 subscribers in the eastern U.S.).

In addition, they not only believe telephony to be more reliable, they expect it to be, because a working telephone can mean the difference between life or death in emergency situations.

Hence, "If you launch a service, and out of the first 10 times someone tries to use it, it's off three times, you probably don't have a business," says Smith.

Because building in reliability is so vital to the success of cable telephony, cable operators need "to have a reliability strategy," says David Fellows, senior vice president of engineering and technology at Continental Cable.

For example, "You ought to know what your system reliability is today," says Fellows; for instance, knowing "how many minutes for whatever line outage you've got. You ought to know why you have outages, and you ought to know that those outages fall within acceptable limits for telephony service, or you need to have a strategy for improving that, either by taking fiber deeper into the system, or having redundancy in parts of the network."

David Fellows

Key to providing reliable service is effective network management, another top challenge.

Central to this–and to cable telephony as a whole–is the construction of the signal return path for two-way communications. That alone is a mammoth task, because it requires cable companies to essentially rebuild their entire plant.

For instance, "We at Cox have about 50,000 miles of coax throughout all of our systems," notes Best. "And we're budgeted to have 20

MPEG Encoding Technology

In the developmental stages of the Centaur and Argus MPEG encoders, it became evident we were onto something much more significant than was ever imagined. Not just another peg in the hole of MPEG technology...but a whole new way of looking at it. We're not pretending to be anything more than we are: A company whose sights have always been set on taking MPEG out there as far as it can go. If cutting edge is a place...we live there. To put it another way,

Argus

Centaur

The future is aVelable now. There's no time like the present to take advantage of it.

Vela Research.
The Wave Of The Future...

813 • 572 • 1230
http://www.vela.com
2501 118th Avenue North
St. Petersburg, Florida • 33716

Reader Service 51

Does broadband data need eye candy?

Execs evaluate video and audio streaming as part of data services

By Fred Dawson

The growing presence of small, but consumer-pleasing video windows on Web sites has raised the bar for the technical parameters in near-term broadband data service rollouts, adding new issues to operators' technical choices.

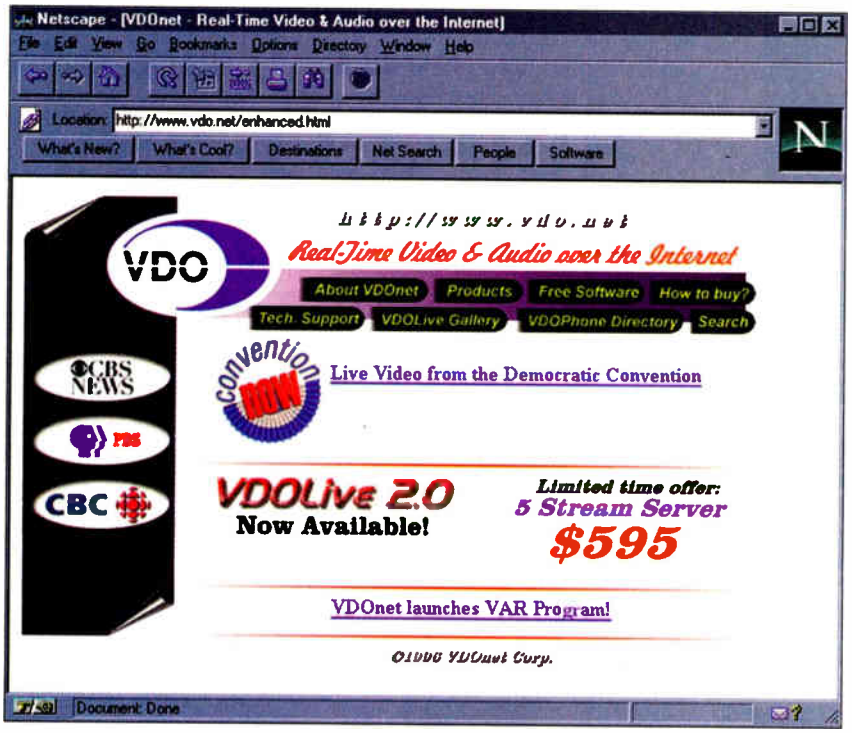
While some experts argue that the key to success with consumers in the early going with broadband data services is provision of fast access to conventional sites, in combination with useful local site components and business applications support, a growing number of cable and telephone executives view system support for video and audio streaming as a vital part of the formula for success.

"We expect to make video a component of what we offer from Day 1 of commercial deployment," says Jeff DeLorne, executive vice president for Continental Cablevision. As its first case in point, the MSO has put together a video-enhanced site with the Jacksonville, Fla. NFL team, the Jaguars, in conjunction with its high-speed data service launch in that community (see graphic, bottom of page).

"The service has to be fully multimedia capable," agrees Steve Craddock, vice president of new media development at Comcast Corp., noting this means voice and audio streaming capabilities as well as video. "Seventy-five percent of everything we learn, we get through our eyes."

While a growing number of operators share such views, there are many veterans of the interactive content business who caution against bending too far over backwards to accommodate advanced multimedia capabilities. Ikonic Interactive Inc., for example, developer of The News Exchange interactive TV channel and several other projects for Time Inc. New Media, comes to this view with a long history of discovering what consumers want is not necessarily what experts anticipate.

"Right from the start we were very aggressive with use of streaming audio and video and VRML (virtual reality markup language)," says Robert May, Ikonic chairman and CEO. "But we found it's not about multimedia and fast access, it's about relevance." As a result, May adds, "We've moved away from developing content with eye candy."



VDOnet's home page. The company says it has the 70th busiest Web site in the world.

The Jacksonville Jaguar's home page is part of a multimedia sports Web site called "Jaguars Online," hosted by Continental Cablevision. Continental used General Instrument's SURFboard modems to demo the Web site during halftime of a game between the Jaguars and the San Francisco 49ers.

More traditional tools

Indeed, some operators are not encouraging their customers to avail themselves of the on-line video streaming capabilities which have become available as browser "plug-ins" from a variety of vendors whose video systems are showing up on Web sites. Time Warner, for example, in working with local "Webspinners" to foster site development for its "Road Runner" launch in Akron and Canton, Ohio, has focused on use of more traditional tools for Web site construction, using off-the-shelf software such as dB Edit and online-enhanced Microsoft Word, says Steve Callahan, content editor for Time Warner Cable's Excalibur Group and a founding member of Time Inc.'s New Media Group.

"We're not supporting third-party plug-ins," Callahan says, noting that users are told they "fool around with

The old Emergency Broadcast System (EBS) has been blown out the window and replaced by the new Emergency Alert System (EAS). And you have less than 273 days to comply*. It means you're going to need some new equipment. But don't panic. We know what you're thinking – wouldn't it be nice if there was an emergency alert system that could contribute to your overall operation? Because, let's face it, most of the time, most emergency systems sit idle.

Well, SDI has just the solution.

Our ACM (All Channel Messaging) system will handle all the video and audio requirements of an Emergency Alert System for even the largest cable systems, but that's not the best thing about it. When ACM is not busy blowing tornado sirens, flash flood or severe thunderstorm warnings, you can put it to work flashing the community bulletin board or local sports scores. Better yet, use it to advertise and switch that pay-per-view special. We're serious: this is the one emergency system that has enough force to pay for itself. And that's not just a lot of hot air. ACM is a proven system, currently in operation at hundreds of facilities around the country.

With ACM, EAS is a breeze. Contact us now at 800-231-1349 and we'll send you our new brochure that shows you why.

404 W. Ironwood Drive, Salt Lake City, Utah 84115 • (801) 464-1600. Fax: (801) 464-1699

Reader Service 54

SDI Your Media Solution

Ad Index

= Advertiser's E-mail or Web address appears on CED's Internet Address Directory on page 82.

Product Showcase

CED INTERNET

The following list contains the Internet addresses or E-Mail addresses for advertisers appearing in CED, and is provided as a service for our readers.

ABC Cable Products, Inc.
http://www.abc-cable.com

ADC Telecommunications, Inc.
http://www.adc.com

ADC Video Systems
http://www.adc.com

Albrit Technologies
http://www.albrit.com

Alpha Technologies
http://www.alpha-us.com

AMP Incorporated
http://www.amp.com

Antec/Network Technologies
http://www.antec.com

Avantron Technologies, Inc.
Email: info@avantron.com

Cable Prep / Ben Hughs Comm. Products
Email: cableprep@aol.com

CED Magazine
http://www.CEDmagazine.com

Corning, Inc.
http://www.usa.net/corning-fiber.com

Eagle Comtronics, Inc.
http://www.eaglefilters.com

General Instrument Corp.
http://www.gi.com

Harmonic Lightwaves
Email: info@harmonic-lightwaves.com

Hewlett-Packard Co.
http://www.hp.com/go/catv

ISC / Datacom
http://www.fastlane.net\~isc

Laser Precision Corp.
http://www.lpc.com

Microwave Filter Co.
http://www.ras.com/mwfilter/mwfilter.htm

Molex Fiber Optics, Inc.
http://www.molex.com

Motorola - Multimedia Group
http://www.mot.com/multimedia

National Cable Television Institute (NCTI)
http://www.ncti.com

Pace MicroTechnology
http://www.pace.co.uk
Email: ian.ward@pace.co.uk

PowerGuard
http://www.antec.com

Qintar, Inc.
qintarlll@aol.com

R. L. Drake Company
http://www.rldrake.com

SAT Corporation
http://www.sat.com

Scientific Atlanta
http://www.sciatl.com

Siecor Corp.
http://www.siecor.com

Siemens Stromberg-Carlson
http://www.ssc.siemens.com

Sony Business & Professional Group
http://www.sel.sony.com/SEL/bppg/videostore/index.html.

Spectrum
http://www.spectrummhz.com

Sprint North Supply
http://www.sprintnorthsupply.com.
Email: Sarah.goodman@nsc.sprint.com

StarNet Development, Inc. (SDI)
Email: info@sndev.com

Superior Electronics Group
http://www.cheetahnet.com

Supercomm 97
http://www.super-comm.com

Synchronous Group
http://www.syngroup.com

TeleWire Supply
http://telewiresupply.com

Trilithic, Inc.
http://www.trilithic.com

Trilogy Communications, Inc.
http://www.trilogycoax.com

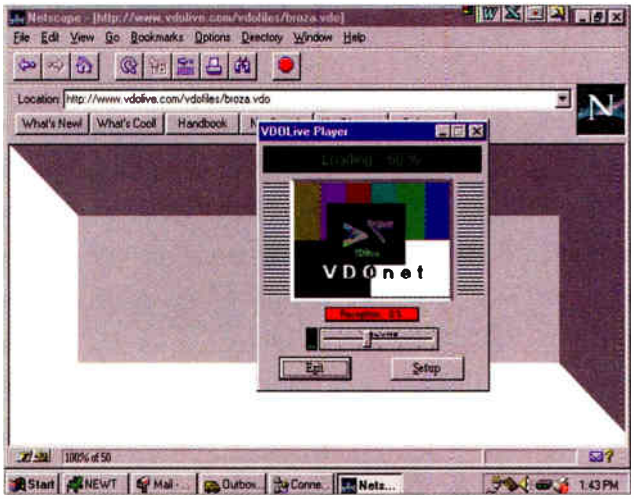
Trompeter Electronics Inc.
http://www.trompeter.electronics.industry.net

Vela Research Inc.
http://www.vela.com

Wavetek Corp.
http://www.wavetek.com

CED magazine is not responsible for any omissions or any inaccuracies. Changes to existing information should be directed to Michelle Pazar; (303) 393-7449; FAX (303) 393-6654.

CED



VDOLive Player: A client which users can download for free that enables them to watch videos. Player is a plug-in to Netscape Navigator and ActivX Control for Microsoft's Internet Explorer.

these things at their own peril." While Time Inc.'s Pathfinder Internet site has been expanded to include a version designed to feed higher quality graphics to customers with cable modems, Callahan stresses that there is relatively little extra content being ported to the high-speed site, and so far, none of it is video.

Such caution rests in the fact that the addition of video streaming greatly complicates system designs, leaving operators with a choice of either spending a lot of money to accommodate high usage rates of video, even though there is a relatively limited amount of video now available, or setting up the systems on the assumption that video usage will be sufficiently sporadic to avoid serious line blockages within standard contention models. Indeed, says Craddock, to accomplish the delivery of services like Comcast has in mind requires a virtual rebuilding of the Internet infrastructure.

"For companies trying to make a business case for offering high-speed access, the decision comes down to, you have to rebuild the Internet," he says. "It has to be high-speed end to end."

But how to accomplish that, and what levels of service to support are key issues, even among those, like @Home Networks, who are in business to provide an alternative to what Craddock calls "the ugly patchwork of connections" that is today's Internet.

"We're still struggling in the content space," says Will Hearst, former @Home CEO and a partner in Kleiner Perkins Caufield & Byers, an @Home investor, along with Tele-Communications Inc., Comcast and Cox Communications. "It isn't really clear to me what the obvious content application is, other than e-mail." While broadband is clearly a consumer product, he adds, it remains "a slippery animal."

Digging deeper

But a look at what's going on in the development of video streaming and compression technologies suggests that the marketplace will soon provide answers to the content question which mandate support for types of applications that are very different from what brings

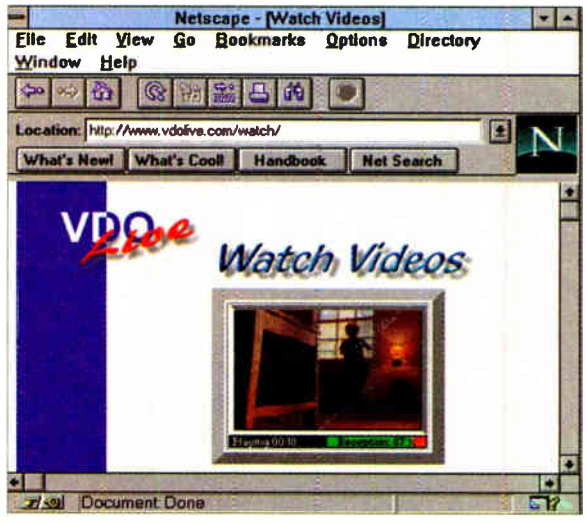
people to the on-line experience today. Given the pace at which video has entered the picture, it's no wonder many broadband strategists have been caught off guard.

"When we introduced our product last year (in November), it was widely perceived that viable video over the Internet would have to wait until at least the turn of the century," says Asaf Mohr, president and CEO of VDOnet Corp., one of the leaders in the fledgling on-line video environment. "Today we have more than 150 sites worldwide, including CBS, which delivered a live broadcast of the Republican convention from its site."

"We're seeing over 13,000 hours a week in video content going out over the 'Net using StreamWorks," comments Howard Gordon, president of Xing Technology Corp., in reference to his firm's widely used video streaming technology. StreamWorks is the tool used at the Jacksonville Jaguars site to support video feeds of player interviews, game highlights and other material to Continental customers.

Xing's StreamWorks, which can distribute MPEG files at low frame rates in small windows over 64 kbps ISDN links, will be employed to deliver separate video streams for low bandwidth and high bandwidth users, according to Doug Perkins, director of Internet services for Continental's Southeast region. "It's a pretty wicked site," he says, noting the high-speed version of the video feed is vastly superior.

Given the types of advances that are about to hit the market, the volume of video usage registered by Xing is likely to seem like a trickle in the near future. For example, Los Angeles-based startup Vosaic Corp. has come up with a way to deliver live multicast, on-demand and other forms of video programming over the Internet at 45 times the bandwidth efficiency of standard IP transport.



Live video running on VDOLive Player.

End-to-end solution

Launched in April and with more than 20 patents pending, Vosaic is commercializing what a co-founder calls "the next implementation of Mosaic" to support these and other capabilities, including VCR-like functionality and hyperlinking within the video window.

quality video at 500 kbps, and we expect to go down to quasi-TV quality at ISDN rates," Mohr says. "This type of performance could create explosive growth in content and consumer participation."

VDOnet's system is not ready for the type of on-line broadcast described by Colby, nor is it capable of literally live feeds on a point-to-point basis. This is because the technology requires at least a brief interval for storing video before it is streamed in order to give the software compression engine at the server time to determine the data rate that each user's bandwidth will support.

"We offer a scalable solution, which supports distribution of the content at whatever frame rate is supported by the user's connection," says Greg Eisips, director of technical marketing at VDOnet. But the system has reached near-live translation speeds. At a recent demonstration, Eisips accessed the CBS News Web site, where the network runs a slightly delayed "live" news feed from its studios. Picture quality and sound were far superior to the video segments VDOnet was showing last spring.

VDOnet is working with PBS, NBC, Cisco Systems and other entities to create centers for developing video streaming applications and to support multicasting of multimedia content, with the first center to be installed in Palo Alto early next year and another in New York soon afterward. "The ability to stream video in real time without requiring storage at the client computer is opening the Web to a whole new level of development," Eisips says.

While the immediate impact of developments at Vosaic, VDOnet, Xing and other innovators will be to enhance the attraction of the narrowband Web environment, these advances will benefit broadband systems as well, developers say. "We're working with a number of cable companies to enhance high-speed access sites," Eisips says.

Xing's Gordon says the firm is working with cable operators in a number of cities to bring high-profile, cutting edge uses of video streaming into the Web experience this fall. "You can expect announcements involving six cable companies over the next couple of months," he says.

With 30,000 of its SURFboard modems on order for Continental's Jacksonville system, no vendor has been more atuned to the potential of video streaming than General Instrument Corp. "Our focus is on encouraging operators, content developers and suppliers to think about the platform as a conduit for videoware," says Mike Ozburn, vice president and general manager of GI's telecommunications group.

"The content is out there," Ozburn adds, noting GI's Videoware Innovation program has drawn participation from Macromedia, Microsoft, Silicon Graphics, Sun Microsystems, PBS and others. "The issue is what the mass market platform is going to be as developers plan to expand the multimedia components on-line."

With support for video streaming built into the modem data protocols of LANcity Corp., and with Motorola Corp. now providing software upgrades to make its data system video capable, the leading modem suppliers in the early startup phase are in a position to make high-speed data the platform of choice for interactive video. That leaves it up to those who are putting in the backbone infrastructure to decide whether the video platform materializes in the cable space. CED

Tap into our resources.

When you deal with TeleWire Supply, you deal with a company that knows your business. Because for more than 40 years, we've helped shape solutions for the cable television industry. And built a heritage of excellence that reflects some of the most trusted names in the business. Need a one-stop resource for your broadband future? It's right here. Where it's always been.

Satisfaction is always in stock.

TeleWire SUPPLY
AN ANTEC COMPANY

Southeast:	Norcross, GA	800-433-3765
Southwest:	Irving, TX	800-643-2288
East:	Rockaway, NJ	800-458-4524
Midwest:	Rolling Meadows, IL	800-428-7596
West:	Santa Ana, CA	800-227-2869

Reader Service 61

Cable '97

New Orleans, Louisiana • March 16-19, 1997

CALL FOR PAPERS

Send Technical Paper Proposals to NCTA by November 6, 1996

One-page summaries of prospective papers will be selected in November by an NCTA Engineering Committee subcommittee. Judges look for reference value and originality. Previously published papers and product pitches are not eligible. Any topic of interest to cable TV engineering managers is acceptable.

Accepted authors must send completed, camera-ready manuscripts (hard-copy and disk in specified formats) to NCTA by January 18 and present a 15-20 minute oral presentation based on the paper at a Cable '97 technical session. Speakers are responsible for their own travel and registration arrangements and fees.

Mail or FAX summaries with author(s) name, company, address, FAX and telephone numbers to:

Katherine Rutkowski
Director, Technical Services
National Cable
Television Association
1724 Massachusetts Ave., N.W.
Washington, D.C. 20036
FAX (202) 775-3698
e-mail: krutkowski@prodigy.com

ncta

National Cable Television Association
1724 Massachusetts Avenue, N.W.
Washington, D.C. 20036
(202) 775-3550

The issue: Signal theft

A year ago, we asked for your input on signal theft, perhaps one of the biggest operational headaches cable operators have to deal with. The National Cable Television Association has estimated that the cable industry loses about $5 billion every year to unauthorized viewers of cable signals–a whopping 20 percent piracy rate. What do you think about signal security? Are you winning the battle?

The questions:

1. What is your system's current penetration rate for basic subscription services?

☐ Below 35% ☐ 35%-55% ☐ 56%-75% ☐ Over 75%

2. What would you guess is the current level of basic service theft in your system?

☐ Less than 5% ☐ 5%-15% ☐ 16%-25% ☐ Over 25%

3. What is your system's current penetration rate for premium services (of all basic subs)?

☐ Less than 50% ☐ 50%-75% ☐ 75%-100%

4. What would you guess is the current level of premium service theft among basic subscribers in your system?

☐ Less than 5% ☐ 5%-15% ☐ 16%-25% ☐ Over 25%

5. How much revenue does your system expect to lose to signal theft during 1994?

☐ Less than $20,000 ☐ $20K-$35K

☐ 36K-$50K ☐ Over $50K

6. What recent steps has your system taken to reduce signal theft?

☐ None ☐ Regular audits ☐ Offer amnesty

☐ Started security program ☐ Other

7. How concerned is your system's management about local signal theft?

☐ Very ☐ Somewhat ☐ Not concerned

8. Has your system filed charges against anyone for service theft over the past year or so?

☐ Yes ☐ No ☐ Don't know

9. What hardware do you have in place to battle piracy?

☐ Scrambling ☐ Traps ☐ Locking pedestals

☐ Set-top descramblers ☐ None

10. Do you think set-top manufacturers could do more to make their scrambling systems more secure?

☐ Yes ☐ No ☐ Don't know

11. Do you think you have more, about the same or a fewer number of signal pirates today compared with a year ago?

☐ More ☐ The same ☐ Fewer

Your comments:

Fax us at 303-393-6654

Make a copy of this page and fax it back to us at the number above, or mail it to *CED*, 600 South Cherry Street, Suite 400, Denver, Colo. 80222.

*Every month, we'll pick one response from those we receive and award $50. See official rules below.

Names won't be published if you request your name to be withheld, but fill out the name and job information to ensure that only one response per person is tabulated.

Your name and title

_____

_____

_____

System name:

_____

Location:

_____

Your MSO:

_____

Your job function:

_____

Daytime phone #:

Official rules: No survey response necessary. Enter by returning the completed survey via fax or mail to the locations indicated above, or print the words "CED Return Path" on a 3"x5" card and mail it along with your name, address, daytime phone number and signature. To be eligible for the drawing, entry forms must be received by 5 p.m. on November 30,1996. CED is not responsible for lost or misdirected mail. One entry per person. Forms mutilated, illegible or not in compliance with these rules shall be considered ineligible in the sole discretion of the judges. Odds of winning depend on the number of entries received. A random drawing from eligible entries will be held on or about December 1, 1996. Winner will be required to provide his/her social security number and proof of identification and is solely responsible for all federal, state and local taxes incurred. Prize is not transferable to any other person. Sweepstakes participants agree to waive any and all claims of liability against CED magazine, Capital Cities Media Inc., Capital Cities/ABC Inc. and its affiliated and independent contractors for any injury or loss which may occur from participation in this sweepstakes or receipt of the prize. Winner consents to publication of his/her name for publicity purposes without further compensation. Participants must be 18 years of age or older. Employees of CED magazine, Capital Cities Media Inc., Capital Cities/ABC Inc. and its affiliated and subsidiary companies, and their respective employees, agents and independent contractors, and their immediate families are not eligible to participate. Void wherever prohibited, license required, restricted or taxed by law. Sweepstakes sponsors reserve the right to change or modify the sweepstakes rules while the sweepstakes is in progress. Participation in the sweepstakes constitutes acceptance of all sweepstakes rules.

RESULTS

The issue: Set-top boxes

Half of 1996 has come and gone and still the cable industry hasn't deployed digital set-tops in any meaningful quantity. Instead, there's a resurgence in interest in analog boxes and the new services they can support. This survey captured your thoughts on digital vs. analog set-top boxes.

The results:

A huge majority of those surveyed are concerned that the cable TV industry has lost its early lead in the digital deployment race to competitors like DBS, MMDS and the telcos, yet few are convinced the high cost of set-tops will allow them to roll out the technology anytime soon.

Instead, many who are deploying analog set-tops are looking at new features, specifically electronic program guides and tailored on-screen messages, to help fill the void.

But an even greater majority are interested in providing consumers with Internet access over their cable set-tops, such as is envisioned by WorldGate and others.

Interestingly, the industry seems split on the issue of standardizing digital set-tops and allowing consumers to buy them at retail, but a majority still thinks that scenario is a bad one.

Congratulations to Terry Draper at Flagstaff Cable, who's our latest winner of $50. To enter, just fill in the survey on the previous page!

1. Does your system presently use addressable set-top descramblers?

Yes	No	Don't know
73%	**20%**	**7%**

2. How old are the set-tops you presently use in your system, on average?

Less than 1 year	1-3 years
13%	**27%**
4-7 years	**7+ years**
27%	**27%**

3. Is your system going to use the new "advanced analog" set-tops (such as GI's CFT2200 or S-A's 8600x?)

Yes	No	Don't know
33%	**7%**	**53%**

4. What new features do you think are most important to consumers?

Program guides	On-screen messaging
60%	**47%**
Virtual channels	**Other**
20%	**13%**

5. Do you think Congress should standardize digital set-tops so that consumers can buy them at retail outlets?

Yes	No	Don't know
40%	**60%**	**0%**

6. Do you plan to roll out digital set-tops to consumers when they become available later this year?

Yes	No	Don't know
13%	**33%**	**53%**

7. How soon do you expect to begin deploying new digital set-tops to subscribers on your system?

In next 6 months	Next year	1998 or later
13%	**21%**	**66%**

8. Several companies are working to allow Internet access via set-tops instead of personal computers. Are you interested in providing such a service?

Yes	No	Don't know
73%	**7%**	**20%**

9. Are you at all concerned that competitors like DBS, the telcos and MMDS operators will have digital equipment in the field before the cable TV industry does?

Yes	No	Don't know
80%	**20%**	**0%**

Your comments:

"With the price of a digital box in the $500 range, many operators are taking a long hard look at putting digital in the field. Many will take a wait-and-see attitude."
– Larry Langevin, Greater Media Cable, Ludlow, Minn.

"Digital is the way to go, but resistance from consumers will be strong and will delay rollout. Vendors should put up or shut up."
– George Buchan Jr., Tele-Media, Troutville, Va.

"We presently have S-A 8600x (set-tops) and are working on an interactive program."
– Pat Guthoff, Cablevision, Yonkers, N.Y.

A Marriage made in Cyberspace

For the fastest information gathering this side of Cyberspace, check out the hottest products the industry has to offer in CED Magazine's Product Literature & Source Guide...Online!

Find CED Magazine's Literature & Source Guide on CED Magazine's Web Site:

http://www.cedmagazine.com

FEATURING:

- On-line request forms for product & literature information
- Hyper-links to manufacturers' web sites
- E-mail links to literature guide manufacturers for questions & requests

PLUS...

- CED Magazine's most recent issues
- Subscription Information
- Editorial Index of past CED articles
- And much more!

CED

COMMUNICATIONS ENGINEERING & DESIGN
THE PREMIER MAGAZINE OF BROADBAND COMMUNICATIONS

Antec to supply TCI telephony upgrade

ROLLING MEADOWS, Ill.–Tele-Communications Inc. (TCI) will use Antec Corp.'s optronics products in several system upgrade projects around the U.S. to offer telephony, high-speed Internet and other future services. Antec will supply 750 MHz Laser Link II transmitter lasers and Laser Link II return receivers. The equipment will be used in several TCI division projects. The company introduced its new line of transmitters last June at the SCTE's Cable-Tec Expo.

Another MSO, Continental Cablevision, has chosen Antec's laser transmitters, fiber cable and Regal taps and passives for a 5,000-mile rebuild of several Chicago-land networks. Continental Cablevision, located in Elmhurst, Ill., is a subsidiary of Continental Cablevision in Boston.

"Antec will supply several products necessary for this Chicago rebuild, which will pass 650,000 homes," according to Gordy Halverson, executive vice president of sales for Antec. "The Continental project, currently underway, is expected to be finished in 1999."

The rebuild project will give the operator the ability to offer telephony, Internet access, pay-per-view and near-video-on-demand services to its customers, according to Alan Jastczemski, vice president of telecommunications and development in Continental's central region.

TeleWire Supply has new service center

ENGLEWOOD, Colo.–TeleWire Supply, a division of Antec Corp., has created a new centralized National Service Center in Englewood. The expanded customer service facility, located in the Inverness Tech Center, will provide the company's customers with product support and technical expertise across the range of TeleWire's broadband products.

Along with the creation of the center, the company also announced that John Ferrarese, from the Rockaway, N.J. office; and Rick Fahilga, from the Santa Ana, Calif. office, have been promoted to regional vice presidents and are relocating to the new center.

Macrovision adds three licensees

SUNNYVALE, Calif.–DX Antenna and Matsushita have become the latest set-top decoder manufacturers to incorporate Macrovision's copy protection technology. DX Antenna has licensed Macrovision's pay-per-view copy protection technology for use in its line of DSS Integrated Receiver Decoders for deployment within the PerfecTV system in Japan. Matsushita Electric Industrial Co. Ltd. recently became licensed to use copy protection technology in its own digital set-top decoders, which it will deliver to subscribers of PerfecTV and DirecTv in the U.S.

In addition, LG Electronics became the 21st semiconductor manufacturer to sign an agreement authorizing them to produce integrated circuits (ICs) with Macrovision copy protection capability.

Harmonic Lightwaves moves to new digs

SUNNYVALE, Calif.–Harmonic Lightwaves Inc. has moved to its new international headquarters in Sunnyvale. The new facility is 110,000 square feet, which is more than double the space of its former locations in Santa Clara, Calif.

The company custom-designed the interior of the new building: structural changes mean expanded and more efficient R&D facilities, enhanced customer service and training capabilities and a significant increase in production capacity, according to the company.

Harmonic's new address is: 549 Baltic Way, Sunnyvale, CA. 94089. The main phone and fax numbers are (408) 542-2500 and (408) 542-2511, respectively.

C-COR to supply Continental rebuild

STATE COLLEGE, Pa.–C-COR Electronics Inc. will provide FlexNet trunks, bridgers and line extenders for a network rebuild being undertaken by Continental Cablevision in Elmhurst, Ill.

The rebuild, which encompasses several suburbs of the Chicago area, will pass more than 600,000 homes and will cover more than 5,000 miles. The project is scheduled for completion sometime in 1999.

To expand its presence in the Canadian market, C-COR has entered into an agreement with Comsource Broadband Technologies Corp., a Canadian-owned national distributor with its corporate office located in British Columbia. Comsource maintains offices in Calgary, Halifax, Montreal, Toronto, Vancouver and Winnipeg and will serve as a C-COR distributor throughout all of Canada.

Cogeco Cable commits to Intelecable

SACRAMENTO, Calif.–Cogeco Cable Inc. and CableData Inc. have finalized a multi-year agreement to deploy the latter's Intelecable customer and transaction management software throughout Cogeco's systems.

Cogeco will invest up to $5 million (Canadian) in upgrading its customer management system over the next three years.

Intelecable provides an integrated database management structure which enables the operator to provide data warehousing, customer management and billing for its existing cable subscribers, as well as future telephony and interactive services customers.

Cogeco provides cable services to more than 460,000 subs in British Columbia, Alberta, Saskatchewan, Ontario and Quebec.

Texscan announces contracts

SALT LAKE CITY, Utah–Marcus Cable of Connecticut has purchased a 3200DS digital ad insertion system from Texscan MSI, a division of TSX Corp. The system will provide the operator with 10 channels of insertion from a single headend. The system consists of a 3200DS server, an intelligent PRIZM matrix switch controller and a system control computer.

TCI-Asheville has completed the initial installation of Texscan's 3200DS system as well. The digital ad insertion system will provide the North Carolina TCI location with 16 channels of insertion from a single headend.

And Access Television Network has entered into an agreement with Texscan MSI to use its PRIZM matrix switch controller.

Access provides the advertising and cable industries with an organized national marketplace for locally targeted, flexible paid programming on cable systems.

N.Y. Interconnect goes with SeaChange

NEW YORK, N.Y.–The executive board of The New York Interconnect, which represents seven major cable system operators, announced that it will create a digital delivery system to more than 4.2 million homes in tri-state metropolitan New York. The decision will enable advertisers served by the Interconnect to insert commercials on 16 cable channels, rather than the present 10, with the possibility for further capacity expansion.

The operators have selected SeaChange International Inc.'s Video Server 100 for the digital insertion of commercials by the 43 individual cable systems they operate in the region.

The operators are: Cablevision, Comcast, TCI, Time Warner and TKR, which operate multiple cable systems; along with Adelphia and Continental. The target date for completion of the upgrade is the first quarter of 1997 at all 43 "headends" served by the Interconnect.

Channelmatic lands ad insertion contract

ALPINE, Calif.–Post Newsweek Cable Advertising of Texarkana has purchased a single headend, 13-channel, Digital LITE MPEG-2 ad insertion system from Channelmatic.

Valued at approximately $150,000, the system was delivered this past July. Other recent Digital LITE contracts for Channelmatic include BCS Cable Advertising of Houston, Daniels Cablevision of Carlsbad, Calif., and Cable Onda of Panama City, Panama. CED

A Bright New Light in the Headend Universe

PULSAR

BARCO introduces PULSAR, a revolutionary modulator for CATV headend applications requiring high quality RF signal and automatic provisioning. PULSAR offers remote monitoring and control of all modulator functions. An intelligent "white limiter" and video AGC prevent overmodulation and automatically optimize video input signal levels.

Remote or Local Control

Easy-to-use front panel keys allow direct control of video and audio RF levels, modulation depth, frequency deviation, and input switching. An RS-485 interface allows remote control of the unit.

Maximum Flexibility

PULSAR operates with 110 Vac or -48 Vdc, making it compatible with both conventional CATV or Telco powering schemes. The modulators feature IF substitution and are compatible with all major scrambling techniques.

Find Out More!

PULSAR gives CATV operators and Telcos an entirely new dimension in signal and service delivery. To find out why PULSAR will transform the future of headend modulators, call 770/590-7900.

- High RF Output Over the Entire Frequency Range
- White Limiter and Video AGC
- Auto Set-Up, Auto Alignment
- Complete Software Control for Monitoring and Backup
- Fixed Frequency and Tunable Versions
- 110 VAC and -48 VDC Powering
- Unique In-Channel Tilt Control

PULSAR BARCO THE ULTIMATE MODULATOR

BARCO

3240 Town Point Drive
Kennesaw, GA 30144
Tel: 770/590-7900
Fax: 770/590-8836

Reader Service 63

OCTOBER

1-3 Digital Network Engineering Training, produced by General Instrument. Location: San Diego, Calif. Call Lisa Nagel at (215) 830-5678.

1-4 Fiber Optics 1-2-3: Installation, Design & Maintenance, produced by The Light Brigade. Location: Denver, Colo. Call (800) 451-7128 for more information.

7-10 Fiber Optics 1-2-3: Installation, Design & Maintenance, produced by The Light Brigade. Location: Atlanta, Ga. Call (800) 451-7128.

9-11 SCTE Regional Training Seminar. Topic: Technology for Technicians II. Location: Marriott Hotel, Springfield, Mass. Call SCTE National Headquarters (610) 363-6888.

10 SCTE North Central Texas Chapter, Technical Seminar. Location: TBD. Topic: System Reliability. Call Lynn Watson (817) 790-7557.

12 SCTE Cascade Range Chapter, Testing Session. Location: Salem, Ore. BCT/E certification exams to be administered. Call Cindy Welsh (503) 667-9390, ext. 226.

Trade shows

October

13-15 Atlantic Cable Show. Location: Baltimore Convention Center, Baltimore, Md. Call SLACK Inc. at (609) 848-1000.

December

11-13 The Western Show. Location: Anaheim, Calif. Call the California Television Association at (510) 428-2225.

January

7-9 SCTE Conference on Emerging Technologies. Location: Nashville, Tenn. Call SCTE National Headquarters (610) 363-6888.

February

3-6 ComNet '97. Location: Washington, D.C. Call IDG World Expo (800) 545-3976.

11-14 Expo Comm Telecomunicaciones Mexico '97, organized by E.J. Krause & Associates Inc. Location: World Trade Center, Mexico City. Call Caroline Ruggieri or Steve Sasse (301) 986-7800.

18-20 OFC '97. Location: Dallas, Texas. Call the Optical Society of America (202) 416-1980.

14-16 19th Annual Newport Conference on Fiberoptics Markets, produced by KMI Corp. Location: Newport Marriott Hotel, Newport, R.I. Call Jackie Ferguson (401) 849-6771.

14-17 NCF/Infovision '96. Location: Rosemont Convention Center, Chicago, Ill. Call Isabel Bauer or Dan Hutton at (312) 559-3323, or (312) 559-3324.

21-23 Private and Wireless Show, produced by Globex. Targeting private and wireless cable ops. Location: Wyndham Anatole Hotel, Dallas, Texas. Call (713) 342-9826.

22-24 Mid-America: 39th Annual Meeting and Show. Sponsored by the Mid-America Cable TV Association. Call Patty O'Connor (913) 841-9241.

29-30 Planning for Cable Telephony, produced by Scientific-Atlanta Institute. Location: Atlanta, Ga. Call (800) 722-2009 (press 3) to register or for more information.

NOVEMBER

4-15 Fiber Optic Technician Training, produced by FiberLight International. Location: Estes Park, Colo. Call (970) 663-6445.

6-8 Philips Mobile Training, produced by Philips Broadband Networks Inc. Location: Truro, Nova Scotia, Canada. Call (315) 682-9105, Ext. 389.

7-8 Operating Analog Headend Systems, produced by Scientific-Atlanta Institute. Location: Atlanta, Ga. Call (800) 722-2009, and press "3" at the prompt.

12-14 Broadband-LAN Laboratory, produced by C-COR Electronics Inc. Location: State College, Pa. Call Technical Customer Services at (800) 233-2267, ext. 4422.

12-15 Fiberworks: Fiber Optic System Training (FOST), produced by Antec. Location: Antec Training Center, Denver, Colo. Call (800) FIBER ME.

13-15 Philips Mobile Training, produced by Philips Broadband Networks Inc. Location: Syracuse, N.Y. Call (315) 682-9105, Ext. 389.

18-21 Fiber Optics 1-2-3: Installation, Design & Maintenance, produced by The Light Brigade. Location: Indianapolis, Ind. Call (800) 451-7128.

19-21 Cable Television Technology, produced by C-COR Electronics Inc. Location: Fremont, Calif. Call Technical Customer Services (800) 233-2267, ext. 4422.

19-21 Fiberworks: Digital Networks Training, produced by Antec. Location: Antec Training Center, Denver, Colo. Call (800) FIBER ME.

DECEMBER

11 T-1 Technical Seminar, produced by ADC Telecommunications. Location: Phoenix, Ariz. Call (800) 366-3891, ext. 2040.

SUPERCOMM '97

JUNE 1-5, 1997 — 10 Year Anniversary — NEW ORLEANS

Thanks, CED!

SUPERCOMM '96 Shattered All Records

The hottest place to be this summer wasn't just at the Oympics in Atlanta. It was in Dallas, where more than 38,000 converged at SUPERCOMM '96, the industry's biggest and best annual communications event.

And as an Official Publication, *CED* was right in the middle of the excitement, bringing you up-to-the-minute coverage of the latest products and technologies from the world's leading communications companies.

CED

Take a look at some of these stats, and you'll see why SUPERCOMM scored a perfect 10:

38,000+ registrants (up 54% from '95)
638 exhibitors (up 13% from '95)
More than 90 countries represented
More qualified buyers
More educational sessions led by industry experts

And if you think those numbers are impressive, get ready for SUPERCOMM '97, June 1-5 in New Orleans. It's going to be an event of Olympic proportions with 650+ exhibitors and 45,000 attendees!

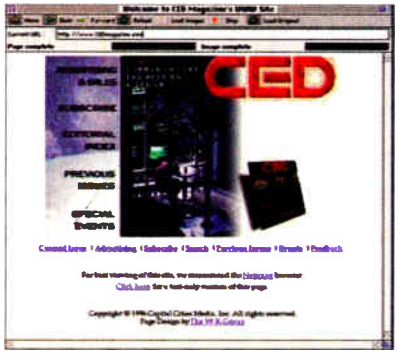
There's still time to book exhibit space for SUPERCOMM '97. But hurry, exhibit space is already 95% sold out. Call (703) 907-7981 today. For information on attending the conference and exhibition, call 1-800-2-SUPERC.

Check it out on the Web
www.SUPER-COMM.com

Explore The Whole World Of Communications

Visit your favorite Chilton Communications Group publications on the World Wide Web!

http://www.ConvergenceMag.com



http://www.CEDmagazine.com

http://www.Multichannel.com

http://www.WirelessWeek.com

Chilton Communications Group
New York • 825 Seventh Ave., New York, NY 10019 • 212-887-8400
Denver • 600 S. Cherry St., #400, Denver, CO 80222 • 303-393-7449

EMERGENCY ALERT SYSTEMS

EAS....?

Solve EAS Problems with
CABLE ENVOY!

- Channel-addressable crawls.
- IF•RF systems supported.
- Modular - Upgradable - Scalable
- Simple installation.
- Text crawl over program signal.
- Avoid channel "knock-down".

Don't drop yours!

Marketed by
Lawson Associates:
Call 801-942-2207
Fax 942-5798

Albrit Technologies Ltd.
40 Waterside New York NY 10010
Internet: http://www.albrit.com

Reader Service 68

TRAPS

EAGLE COMTRONICS INC.

TELEPHONE TRAPS

CALL FOR
FREE SAMPLE
(800) 448-7474

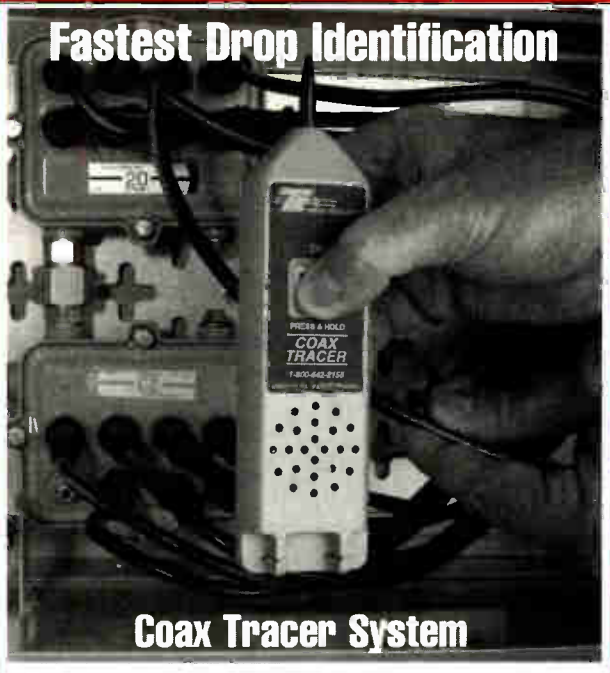
EAGLE COMTRONICS INC.
4562 Waterhouse Road, Clay, New York 13041
(315) 622-3402 *(800) 448-7474*
Telex #937361 *Fax#(315) 622-3800*

Web Site: http://www.eaglefilters.com
Email: eagle@eaglefilters.com

Reader Service 69

TEST & MEASUREMENT

Fastest Drop Identification



Coax Tracer System

Tempo's Coax Tracer System (CTS) takes the guesswork out of coax identification and location. The unique probe identifies the transmitters two tones inductively and capacitively, finds splitters and shorts and helps in troubleshooting drop problems, thus saving you time at drop identification. Call today for more information.

TEMPO RESEARCH
Finding A Better Way
1221 Liberty Way • Vista, CA 92083
(619)598-8900 • FAX (619)598-5634
(800)642-2155

Reader Service 67

TOOLS

Technology that's easy to grasp

Our innovative **compression tool** sets new standards in convenience and usefulness. Weighing only .7 lb., this versatile tool fits easily in your pocket and is comfortable in any size hand.

Catalog: **800.233.8713**
Fax: 717.494.0860

Atlantic Cable Show
Baltimore

LEMCO

Reader Service 71

Bandpass, notch filters for 23 GHz

EAST SYRACUSE, N.Y.–Microwave Filter Co. Inc. has introduced the Model 11422 Bandpass Filter and Model 11423 Notch Filter which isolate transmit and receive operations at 23 GHz to eliminate interference in cable television transmission systems.

Model 11423 and Model 11422 filters

The Model 11422 has a passband of 23.0-23.6 GHz, and a loss of 0.7 dB maximum. Passband ripple is less than 0.5 dB, and return loss is 16 dB minimum, 10 dB minimum at 22.12-22.72 GHz, and 10 dB minimum at 23.88 GHz. Impedance is 50 ohms.

The Model 11423 has a notch frequency of 22.86 GHz and notch depth of 60 dB minimum. Passband is 23.0 -23.6 GHz, passband loss is 0.7 dB maximum and passband ripple is less than 0.5 dB maximum. Impedance is 50 ohms.

Circle Reader Service number 76

Headend controller

ANDOVER, Mass.–LANcity Corp. has developed a 750 MHz headend controller which offers a 60 percent reduction in physical rack space, with as much as a 50 percent decrease in per-cable-modem headend integration costs, according to the company.

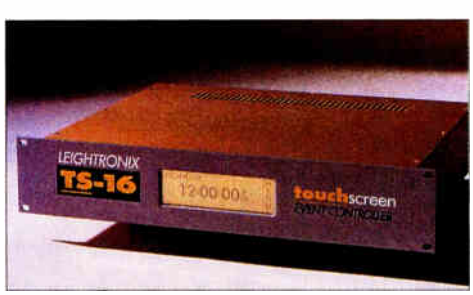
Dubbed the LANcity Headend Controller, the product provides a minimal rear-wiring connection in addition to remote access anywhere on the network. Contained within a 3.5-inch side-by-side rack, the controller's small packaging offers a 60-percent space-saving reduction in headends over previous, multiple devices taking nine inches of space, according to LANcity.

The controller also offers simplified wiring connections and remote control to the console and to the local front-panel control and display. Remote management can take place anywhere on the local or regional cable network, or from designated computer locations worldwide. Remote control enables cost-reduced "lights-out" operation for smaller headends, while optimizing operational resources at larger regional headends, as the demand increases for cable modems to be brought on-line.

Circle Reader Service number 77

Touch screen event controller

HOLT, Mich.–Leightronix Inc. has introduced the TS-16, a touch screen event controller suited for automation of locally originated programming. Built with all of the features of the Leightronix PRO-16, the TS-16 also has a touch screen control panel. Standard features include machine control for 16 VCRs, an internal 16 x 4 true matrix video and stereo audio routing switcher, Event Manager software and a five-year warranty.



TS-16 programmable touch screen event controller

The TS-16 comes with an RS-232 communications port for direct connection to a PC or modem. Capable of controlling up to 16 independent VCRs, the unit's dual PRO-BUS output connectors initiate the PRO-BUS that interconnects with modular RJ-11 telephone cables and is then looped between the VCR interfaces. Each PRO-BUS maintains a user-selectable address for individual or group control.

Circle Reader Service number 78

Monitoring platform

SARASOTA, Fla.–Superior Electronics Group Inc. has introduced a new monitoring platform, the Power Control Module transponder (PCM). The PCM is designed to monitor and control the operational functions of centralized powering systems being developed for the broadband industry.

The rack-mountable unit collects data from the centralized power node's internal control module and transmits the information via RF modem to the Cheetah System. The software will then monitor, alarm and control all the critical functions of the centralized power system.

Any manufacturer-specific protocols are translated in the Cheetah Communications Controller to an industry standard SNMP protocol for exporting to a higher order OSS, when applicable.

The PCM will be specifically designed to monitor each manufacturer's centralized powering system, according to the company. The first version of the PCM being deployed will be for monitoring the Alpha Systems Broadband

Dual wavelength laser source

CAMARILLO, Calif. – RIFOCS Corp. has introduced a palm-sized Dual Wavelength Laser Source (#262A) that provides for two calibrated laser outputs at 1310 nm and 1550 nm. Featuring one output port, the fiber does not need to be disconnected when switching between wavelengths.

The unit allows for basic CW operation and modulated output with three modulation frequencies, 270 Hz, 1 kHz and 2 kHz. The 262A features the precision Universal Connector Interface (UCI)

RIFOCS Corp.'s 262A Dual Wavelength Laser Source

which accommodates all industry-standard fiber optic connectors via a complete line of screw on/screw off UCI adapters.

The unit has been designed to assist in a variety of testing applications, including connector loss testing, testing single-mode fiber optic links, continuity testing and system maintenance. The 262A was designed to work with RIFOCS 555B OPM and its multi-wavelength storage capabilities to perform such tasks as dual wavelength link testing.

Power for the 262A is provided by two AA alkaline batteries which can deliver more than 50 hours of operation.

Circle Reader Service number 75

Powering System (BPS), says Superior.

Circle Reader Service number 79

Two-channel multiplexers

MINNEAPOLIS–AOFR, a subsidiary of ADC Telecommunications Inc., has introduced its new two-channel 1533/1557 wavelength division multiplexers (WDM) and demultiplexers. The devices allow service providers to expand the capacity of their networks' existing fiber, and provide cost savings, as compared to the alternative of deploying additional fiber, according to AOFR. Because the additional channel is in the 1550 nm window, both channels are amplified together by a single EDFA (erbium doped fiber amplifier).

Configurations for both unidirectional and bidirectional communications over a single fiber are available. Both configurations feature low insertion loss to maximize the available optical power budget. The WDM products also have the ability to add or drop a second wavelength.

Circle Reader Service number 80

Broadband access system

HICKORY, N.C.–Siecor Corporation has debuted its FlexWay System, a comprehensive broadband access system designed to provide application solutions for network infrastructure from the service provider through the outside plant to the subscriber location.

The Service Provider Access offers high-density fiber solutions for growing fiber bandwidth demand and the deployment of broadband residential access. The Service Provider system includes: Siecor's 216-fiber Ribbon Riser Cable, FREEDM Cables, 1440-fiber High Density Optical Splice Enclosure, 1440-Fiber High Density Fiber-Manager System, OptiCon Fiber Manager Software, Intelligent Patching System, FuseLite Termination System, UniCam Connector and the OTDR Plus Multitester.

Siecor's Service Provider Access system

The Outside Plant Access network has been designed to facilitate the evolution of future broadband architectures and optimizes network life cycle costs. The FlexWay Subscriber Access system extends bandwidth capabilities to the home from the distribution and drop to the subscriber wall box.

Circle Reader Service number 81

Fiber optic tester

MEDFORD, Mass.–Fotec has introduced its handheld FOtestR CATV fiber optic tester. Using a patent-pending technique, the unit measures power up to +26 dBm (and down to -26 dBm), while providing headroom for the new ultra high-power transmitters coming into the market.

Fotec's FOtestR CATV fiber tester

Powered by a 9V battery which provides up to 120 hours of service, the FOtestR's circuit technology makes it unnecessary to calibrate more often than every five years. The unit features 1300 and 1550 nm wavelength calibration, a resolution of 0.1 dB and an accuracy of 0.4 dB (NIST traceable).

Circle Reader Service number 82

Cable/fault locator

AUSTIN, Texas–The 3M Telecom Systems Division has introduced the Dynatel 2273 Cable/Fault Locator that features advanced digital signal processing techniques to measure and pinpoint sheath faults on both short and long cable sections while tracking underground cable. If a fault is located, the severity of the fault is indicated on the handheld receiver's LCD display.

3M's Dynatel brand 2273 series cable/fault locator

The compact locator unit accurately determines cable path and measures cable or sonde depth, giving a digital readout in inches, feet and inches, or centimeters. The cable locator uses four active trace frequencies, 577 Hz, 8 kHz, 33 kHz and 200 kHz. It also measures signal and current, identifies cable and cable pairs, and locates energized power cable with direct readout of cable depth.

The receiver has four modes of operation for cable location over short or long distances: dual peak, dual mull, differential or special peak. The 2273 also features a passive trace frequency, 50/60 Hz user selectable, which does not require the use of the transmitter.

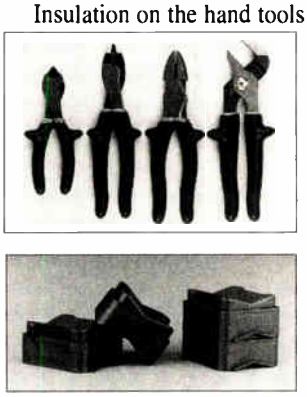
When used with Dynatel's 2205/2206 EMS Marker Locating Accessory, the unit can also pinpoint the exact location of buried EMS markers.

Circle Reader Service number 83

Insulated tools, cable spacers

MEMPHIS, Tenn.–Thomas & Betts has introduced a new line of 1,000V Insulated Hand Tools and the CSS-360 Cable Spacer.

Insulation on the hand tools consists of two layers–a yellow undercoat and a flame-retardant, impact-resistant blue top coat. The injection-molded grips assure uniform thickness and dielectric integrity. The tools have also passed a 10,000 VAC proof test.



Thomas & Betts' Insulated Tools and CSS-360 Spacers

The CSS-360 cable spacers, designed specifically for coaxial and fiber optic cable, feature rounded corners to prevent deformation to the cable geometry. The half-inch tall spacers can be stacked to meet the specific needs of any user.

Circle Reader Service number 84

PRODUCTS, SERVICES & EQUIPMENT DIRECTORY

- Call Tim Reeder at 800-866-0206 or 610-964-4982 by the first of the month preceding the month of the desired issue.
- Fax copy and insertion order to 610-964-4663.
- Mail ad materials to: CED Classifieds, 1 Chilton Way (4th Floor), Radnor, PA 19089.

PRODUCTS, SERVICES & EQUIPMENT DIRECTORY

Established 1980 — Member SCTE

Ervin Cable Construction, Inc.
1800-232-7155
Communication Construction Specialist

Fiber, Aerial and Underground Construction	
Fiber Splicing	Upgrades
Design and Mapping	New Builds
Directional Boring	Coaxial Splicing

Top Quality Workmanship and Equipment
260 N. Lincoln Blvd. East • Shawneetown, IL 62984

RETURN ACTIVATION

TSB
(800) 292-0126
(605) 426-6140
IPSWICH, SD

- ***Headend Services***
  - COMPLETE HEADEND RELOCATION SERVICE
  - RERACK AND REWIRE
  - OPTIMIZE
  - PROOF
- ***FCC Proof Performance***
  - RF PROOFS
  - VIDEO TRIANNUAL PROOFS
- ***On Site Training***
- ***Design and Drafting***
  - STRAND MAPPING
  - AS BUILT MAPPING
  - SYSTEM DESIGN
  - MAP MANAGEMENT & SYSTEM UPDATES

MFC
MICROWAVE FILTER COMPANY
6743 KINNE STREET
EAST SYRACUSE, NY 13057

800-448-1666 • 315-437-3953
Fax: 315-463-1467
http://www.ras.com/mwfilter/mwfilter.htm
E-MAIL: mfc @ ras.com

CADD Services Group, Inc.
Mapping and Engineering Solutions

"Mapping the 21st Century's Information Super Highway"
Cable TV • Power • Gas • Telephone • Water/Waste Water

Services include:
Consulting • Data Conversion • GIS/Facility Mapping
Data Base Design • Field Walkout • Fiber/Coaxial Design
Focus™

CADDSTAR™
GIS Software

For more information contact:
405 N. Reo Street • P.O. Box 20112 • Tampa, FL 33622-0112
Telephone: (813) 289-4119 • Facsimile: (813) 287-3674

EMERGENCY ALERT SYSTEMS
By
Idea/onics

TO MEET THE FCC MANDATE
or For local franchise requirements
Complete Audio and Video
or Audio only systems available
Compatible with all headends
Affordable
Idea/onics
The pioneers in Emergency Alert Systems
(701) 786-3904 FAX (701) 786-4294

CED CLASSIFIED MAKES DOLLARS AS WELL AS SENSE! DO SOMETHING INTELLIGENT. CALL TIM REEDER TO RESERVE SPACE. 800-866-0206

WE BUY & SELL SURPLUS NEW & USED
CONNECTORS, TAPS, HEADEND, LINEGEAR, MISC.
TM BROKERS
5402 HIGHWAY 95 - COCOLALLA, ID 83813
TEL: 208-683-2797 OR FAX: 208-683-2374
EMAIL: moorst@comtch.iea.com
HOME PAGE: http://www.iea.com/~moorst/
We Now Accept M/C And VISA

Industry Service Since 1966

ROCKY MOUNTAIN JUMPER CABLES
P.O. BOX 9707 • HELENA MT 59604

Custom Made Jumper Assemblies
All Brands Fittings/Cable

• F Male	• RG - 59	• F Female
• RG - 56	• BNC	• RG - 11
• PL	• Other	

Our jumpers never leave our plant during construction, insuring inspection of each phase of construction. Our quality control insures you the lowest RF leakage possible. Call for pricing and free sample. (406) 458-6563

BUY | SELL | REPAIR | MFG | UPGRADE | Scientific Atlanta

dB-tronics

Upgrading or adding channels?
Contact us for all your equipment needs.

- ✔ *S-A II Amps*
- ✔ *GIX Gear*
- ✔ *Videociphers*
- ✔ *Addressable Converters*
- ✔ *S-A, C-COR EQ's*
- ✔ *Magnavox Upgrades*

864-574-0155 • Fax 864-574-0383 • e-mail sales@dbtronics.com
http://www.dbtronics.com

RF Networks
QPSK MODEMS
- 56 Kbps to 10 Mbps
- Agility 0.5 to 750 MHz

(602) 861-3652
FAX: (602) 861-0251

Products, Services & Equipment Directory

JONES BROADBAND INTERNATIONAL — **WE BUY AND SELL QUALITY CATV EQUIPMENT**

LINE AMPLIFIERS, TAPS, CONNECTORS
CONVERTERS - ALL TYPES AND MAKES
HEADEND EQUIPMENT
FAX US YOUR SURPLUS INVENTORY LIST
PH: (619) 631-2324 • FAX: (619) 631-1184

BOUGHT/SOLD/SERVICED

450 MHz MAG Station, GI Station, SA Station, C-COR Station — **$349-**

450 MHz MAG LE, GI LE, SA LE, C-COR LE — **$85-**

ALL TYPES OF EQUIPMENT WANTED
-Fax List-
WE SERVICE WHAT WE SELL

ARENA SERVICES, INC. *SINCE 1982*
1-800-98-ARENA Fax 1-610-279-5805

Position Wanted

SYSTEM DESIGN

Position sought in Boston area. 10 years field experience. Recent course by GI on System Design completed.
Call (617) 944-1213

Career Opportunities

SCTE Member

Peter Froehlich & Co. Executive search

P.O. Box 339 Weatherford, TX 76086
(800) 742-4947 FAX (817) 594-1337

All levels of Technical Positions - Corporate to Hourly. Operators and Manufacturers
Call or Write. Fees Paid.

Multilink

REGIONAL SALES MANAGER & INTERNATIONAL SALES MANAGER
wanted for growing premise and CATV telecommunications company. CATV industry experience required. Send resumes to P.O. Box 955, Elyria, OH 44035 Attn: 222.

Career Opportunities

CONSTRUCTION

AERIAL, UNDERGROUND, & SUPERVISORS PERSONNEL NEEDED

EXPERIENCED AERIAL, UNDERGROUND CREWS, AND EXPERIENCED SUPERVISORS NEEDED IN THE MIDWEST & SOUTHEAST PARTS OF THE USA.
CALL OR SEND RESUME TO:
ERVIN CABLE CONSTRUCTION, INC.
P.O. BOX 548
SHAWNEETOWN, IL 62984
(618) 269-4411

CABLE SEARCH ASSOCIATES

Professional Search and Placement
Engineering Sales
Management Marketing
Technicians Construction
Call or Write
Wick Kirby
Phone: (630) 369-2620
Fax: (630) 369-0126
P.O. Box 2347
Naperville, IL 60567

FEES PAID FEES PAID

Communications & Computers

REMOTES

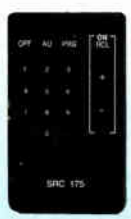
BUY FACTORY DIRECT AND SAVE!

SA 8600
Operates 8600 on-screen program
$4.50

JER 550 (w/vol)
DP, DPBB, DPV, DQN 5&7, Starcom VI, DL4
$4.00

PIRC 82A (v/vol)
Operates Pioneer 5000 & 6000
$4.00

SRC 175 (beige)



SRC 175 (black)
Operates all 8500 to 8580 series non-volume SA converters
$4.00

ALSO NOW AVAILABLE:

SA 475	PAN 120
JER 400	PAN 140
JER 450	PAN 170
JER CFT 2000	PIONEER (w/vol)

TOCOM, ZENITH, 6-in-1 UNIVERSAL
All remotes are quality tested. Call for specs

— VOLUME DISCOUNTS ENCOURAGED —

TOP CASES

JC 7200 **$3.75** any quantity
Fits Jerrold 7200 series.

SC 8600 **$5.95** any quantity
Fits Scientific-Atlanta 8600 series.

ALSO AVAILABLE:

SA 8500	PAN 110
SA 8511	PAN 120
SA 8520	PAN 130
SA 8525	PAN 140
SA 8550	quantity
SA 8580	pricing
SA 8590	discounts!

NOVAPLEX **800-644-6682**

— samples available on request —

Novaplex, Inc. 8818 Bradley Ave, Sun Valley CA 91352
FAX: 818/504-6522 credit terms available

CAREER OPPORTUNITIES

DIGITEL
NETWORK SERVICES, INC

the nation's fastest growing HFC network design contractor, is presently accepting applications for the following positions:

- BROADBAND DESIGNERS
- CADD DRAFTERS
- DATA ENTRY PERSONNEL
- SYSTEM PROOF/SWEEP & BALANCE TECHNICIANS
- FIBER SPLICERS
- FIELD ENGINEERS
- FIELD MAPPERS

Excellent Compensation & Benefits

Mail Resume to:
DIGITEL NETWORK SERVICES
1335 Old Norcross Road, Lawrenceville, GA 30245
or fax to: (770)682-4500

CHIEF TECHNICIAN

$26,000 to $30,000

Tri-County Cable is seeking a self motivated, hands-on individual to assist in supervising its west Alabama cable television operation. Responsibilities include employee and workload oversight, system and headend maintenance, CLI, special project management, and inventory control. Successful candidates will possess five years of cable and electronics experience, one year of foreman or supervisory experience, and knowledge of basic CATV test equipment. A valid drivers license and clean driving record is required. Tri-County Cable is an E.O.E.

To apply, please fax or send resume to:
Tri-County Cable • P.O. Box 900 • Roanoke, AL 36274 • Attn: Chief Tech
Fax: 334-863-2027

ENGINEERING OPPORTUNITIES

Zenith Network Systems is a leader on the interactive multimedia communication frontier. Explore the career opportunities our bold direction has created.

COMMUNICATION & DIGITAL HARDWARE ENGINEERS

We require a BSEE and 5+ years experience in digital hardware design of real-time communications or data products, with one year of FPGA design/testing. Candidates must also offer Intel X86 or other embedded processors as well as PC Work Stations, windows and DOS based tools experience. Background in packet control, TCP/IP, XILINX and Intel Assembler are pluses. Some positions also require experience in analog and digital R. F. circuit design.

SOFTWARE ENGINEERS

Positions require a BS CS/CE/EE and a minimum of 3 years of real-time embedded microprocessor development using C and Assembler. Past work must include development of voice/data or network systems and have emphasized the use of structured or OO methods. Some positions require C++, others require strong multi-tasking expertise, DSP, game or low-level multi-media development. MPEG transport knowledge desirable.

PC APPLICATIONS ENGINEERS

BS CS/CE/EE with 2+ years developing applications for the PC using one of the following: TCP/IP, SNMP, NT, UNIX, Windows 95 or MFC. SQL Server or 32 bit programming knowledge desirable.

ENGINEERING PROJECT MANAGER

BS CS/CE/EE with the ability to track and prioritize multiple projects and act as interface between manufacturing, engineering, marketing and sales. Role requires a minimum of two years directly related engineering project management accountability in combination with at least 6 years overall engineering experience. Expertise should include MS Project or other software tracking systems. MBA a plus.

Enjoy an open, congenial work atmosphere that places a high value on creativity, innovation and team work. A relevant advanced degree is preferred for all positions. Principals only. Forward your resume to: **Toni Kibort, Zenith Electronics, 1000 Milwaukee Avenue, Glenview, IL 60025. Fax: 847-391-7291.** An Equal Opportunity Employer. M/F/D/V.

ZENITH

CDI®
CDI Telecommunications, Inc
is hiring experienced people for the following positions:

DESIGN ENGINEERS
Design Fiber & Coax Broadband Routes.

TECHNICIANS
Installation, Cut-over, Testing, Upgrades

Call: (800) 669-1890
Ext. 895
Fax: 800-875-1904
Attn. CB895

Mail resume to:
P.O. Box 4056, Dept. 95
Scottsdale, Arizona 85261-4056

WESTERN KENTUCKY UNIVERSITY®

CATV/VIDEO TECHNICIAN

Responsibilities include the maintenance and some operations of the University's two Cable-TV systems along with maintenance in other video and audio areas of WKU's Educational Television Service including WKYU-TV, Ch-24.

Qualifications: Good organizational, communication, and writing skills; the ability to work independently; working knowledge of DOS/Windows, IBM compatible PC's; two years of formal training in electronics or equivalent experience in electronics. Experience with Data Networking and the Internet preferred.

Applications for this position are available at the Department of Human Resources, Wetherby Administration Building, Room 42, Western Kentucky University, 1 Big Red Way, Bowling Green, KY 42101-3576. Applications must be received by November 5, 1996. Women and minorities encouraged to apply. Western Kentucky University is an Affirmative Action/Equal Opportunity Employer.

ENGINEERING POSITIONS AVAILABLE

Heartland Wireless Communications has the need for a number of highly qualified Regional Engineers:

Requirements:

- 10 Years of Cable TV Experience
- Extensive use of test gear
- Proven record of project management
- Experience in Headend construction and maintenance
- Significant travel is required
- The ability to manage a region with 10 systems
- Recognized personnel training, support and Technical experience

Heartland Wireless Communications offers a competitive salary, 401K plan, health plan, bonus plan and the opportunities to advance through career.

Send resume and salary history/requirements to:

Heartland Wireless Communications, Inc.
E.O.E.
401 W. Evergreen
Durant, OK 74701
Attn: Engineering

Head in the right direction with... ARROWSMITH

Help deliver 25% improvement in Field Service Productivity

Re-Engineering Specialist/Consultant

Arrowsmith Technologies, Inc., headquartered in Austin, Texas, has developed an innovative workforce management system for the telecommunications market. This system, FLEETCON, is the recognized leader in the cable television/video services industry and we are rapidly deploying to other markets. We currently have an outstanding career opportunity for a Re-Engineering Specialist/Consultant.

The qualified individual will perform operations assessments of existing customer field service operations, baselining analysis of current technician/dispatch performance, and follow-up analysis to determine the actual delivered benefits of the FLEETCON system. The individual will also work closely with the customer's management team and Arrowsmith's installation and training team to help guide the formation and implementation of new operational processes associated with FLEETCON's deployment.

Qualifications include: Seven years experience in video services or related industries, management experience in CATV/telephony dispatch, field service and/or customer service, to help integrate our system into our customer's operations.

We offer excellent benefits and compensation commensurate with experience. Qualified candidates should forward a detailed resume to: **Arrowsmith Technologies, Inc., 8920 Business Park Dr., Austin, Texas 78759, Attn: Human Resources. FAX 512-349-8222.** EOE.

Visit Arrowsmith's homepage at http://www.arrowsmith.com

ARROWSMITH TECHNOLOGIES, INC.

Since 1975 we have served the CABLE-TV industry by matching talent with opportunity.

JIM YOUNG & ASSOCIATES
One Young Plaza - 1235 Ranger Highway - Weatherford, Texas 76086
Call (800) 433-2160 or Fax (817) 599-4483

KEY ACCOUNTS MANAGER/CATV & /APPLICATIONS ENGINEERS-CSG

VA-based manufacturer of quality fiber optic transceivers for video/audio/data communications since 1978, has immediate and 1997 openings for inside HQ and outside sales personnel in select territories throughout North America, within the company's Communications Systems Group. Candidates must have a bachelors degree and a progressively increasing, demonstrated history of field sales success. Knowledge of fiber optics, video applications (CCTV, CATV, broadcast) and systems integration a plus. Responsibilities include generation of new sales, existing account maintenance, distributor/rep and territory management, trade shows, live demos to end-users, VARs, MSOs and RBOCs, etc. Travel required. Relocation unnecessary. Send resume and salary history in confidence to: **VP-Sales and Marketing, Force, Inc., 825 Park Street, Christiansburg, VA 24073 or e-mail @ http://www.forceinc.com. E.O.E. No calls, please.**

TRAINING

TRAINING

Learn to splice, test, connect and troubleshoot a fiber optic network.

(970) 663-6445

FIBERLIGHT INTERNATIONAL
2100 W. Drake, #269
Ft. Collins, CO 80526

SCTE Senior and Fellow membership

By Walter S. Ciciora, Ph.D.

Have a comment?
Contact Walt via e-mail at: wciciora@aol.com

Because you're reading this magazine, it's very likely that you are a member of the Society of Cable Telecommunications Engineers (SCTE). On the small chance that you are borrowing this copy of the magazine or just haven't gotten around to joining the SCTE, let me encourage you to join. The technology of telecommunications is rapidly advancing; we all need some way of keeping up with that advance so that we are not left behind. The best way I know of for keeping up with the technology of telecommunications is by *active* membership in the SCTE. Participation in the local chapters, the conferences and the conventions and reading the publications is essential to staying on top of the technical evolution of our industry.

In the event you need to know how to contact the SCTE, the address, phone and fax numbers are: SCTE, 140 Philips Road, Exton, PA 19341-1318. Phone: 610-363-6888; Fax: 610-363-5898.

Senior membership

Assuming you are an active member of the SCTE, the next step is Senior membership. This grade is attained by nomination or application. Most Senior members have applied for that level of membership.

You might wonder why you should consider Senior membership. The most important reason is probably that it shows support and involvement in your Society. You can't be a passive member and achieve Senior membership status. You need to be involved. That's good for the SCTE, and it's good for you and your career.

There are serious requirements for Senior membership. You have to demonstrate 10 years of electronics experience, including five years in our industry and five years as a member of the SCTE. You can't join the SCTE as a Senior member; you have to *grow* into it. You need three endorsements from other Senior or Fellow members. You must demonstrate technical competence through passing exams from the Broadband Telecommunications Engineer certification test series and/or show other evidence of technical competence.

Once you achieve Senior membership, you should proudly display the Senior membership certificate. By all means, include your membership status in your resume.

The SCTE Bylaws say: "Fellowship is granted only at the pleasure of the Society." This is the highest membership level in the Society. Fellow members can only be nominated. It is not possible to *apply* for Fellow membership. As such, Fellow membership means that others hold you in high regard and great respect. The number of Fellow members is limited to only one percent of the total membership. As such, it is a special distinction. At present, the SCTE has only four Fellow members: Ron Hranac, Dave Large, Archer Taylor and Ted Hartson.

The requirements for Fellow membership are stringent. Twelve years of electronics experience, seven years in our industry and five years of SCTE membership are required. While anyone can nominate another member for consideration for Fellow membership, those who can endorse for Fellow membership are limited. The eventual goal is that only Fellows can endorse candidates for Fellow membership. An exception has been made to get the ball rolling. The list of those who can now endorse includes Fellows from the Institute of Electrical and Electronics Engineers (IEEE), Fellows from the Society of Motion Picture and Television Engineers (SMPTE), those who have won the National Cable Television Association (NCTA) Vanguard Award in Science and Technology, and *CED* magazine's "Man of the Year" award winners.

In addition, technical competence must be demonstrated. The primary approach is to be fully certified as a broadband communications engineer by the SCTE. However, it is possible to substitute other evidence of technical competence for five of the seven categories in the exam series. All candidates must take the category VII exam on professionalism. In addition, they must select one of the other categories.

The candidate must have made contributions to the cable telecommunications industry. The types of contributions considered include technical innovation in products, in operations, in developing new markets and in technical training.

Fellow members will have contributed to the betterment of the Society. They will have participated in local chapter efforts. They will have presented papers at the Society's conferences and conventions. They will have served in office at the local and national levels.

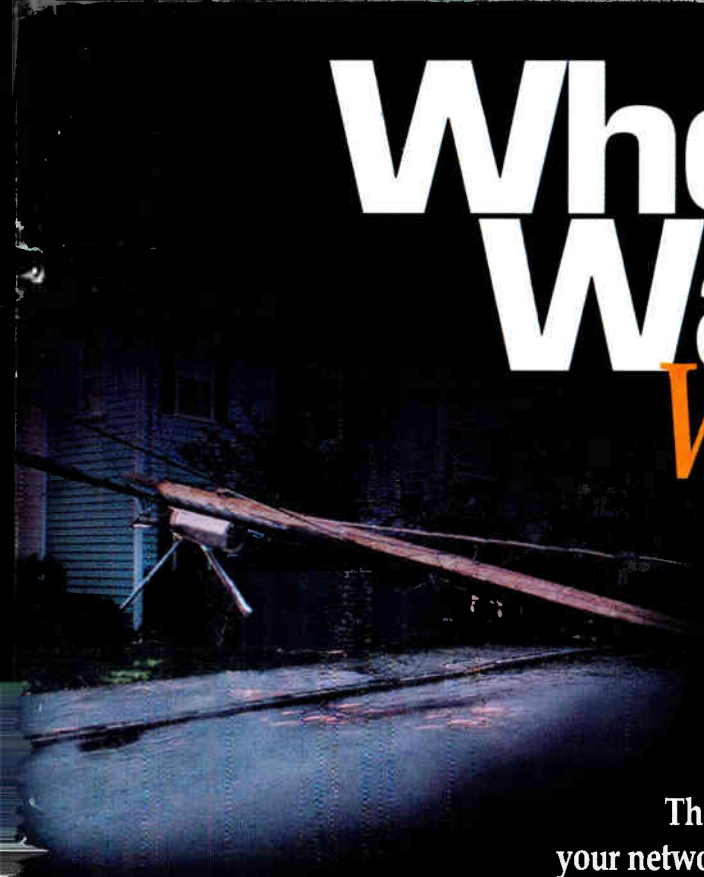
The process of nomination is detailed. A comprehensive personal history is accumulated. Extensive forms are filled out. Those willing to endorse are recruited. It is a difficult and time-consuming task to nominate someone for Fellow membership.

Nonetheless, it is important that you look around and determine if you know anyone worthy of the honor of Fellow membership. If you do, request the forms from the SCTE at the address or phone numbers listed above; in particular, ask for Janene Martin. She will be able to mail or fax you the details. You may request a floppy disk copy of the forms and fill in the blanks, which will result in the easiest forms to read. Eventually, there will be an SCTE home page on the Internet, and it's expected that the forms will be available there as well.

Once again, consider Senior membership application for yourself if you have not already achieved that level. Then look around and find someone to nominate for Fellow membership. The process is arduous, but a deserving colleague will appreciate your efforts, and the SCTE will grow because of them. CED

Who's Watching...

When you're not?



Innovative Status and Performance Monitoring Solutions from Cheetah.

Continuous Monitoring.

The Cheetah System never sleeps. When you are away from your network, rest assured knowing you will be notified of equipment problems or out-of-spec conditions. Should a power supply fail, a modulator deviate from specifications or if system Carrier-to-Noise impacts picture quality, the Cheetah System makes sure you know. And you'll be aware of it before your subscribers call.

Improve Performance.

The Cheetah System helps you manage your network. Monitor headend and distribution devices throughout your multi-vendor plant. Measure ingress and noise on your return path. Fully automate all your performance measurements including non-interfering distortion monitoring, measurements, levels and frequencies. Plus with Cheetah, your network reliability increases, giving you the flexibility, quality and control you require to implement new data and video services.

The International Benchmark.

The Cheetah System is a standard around the world. From the Pacific Rim and South Pacific to Europe, Latin America and North America, Cheetah monitors the world's broadband networks. For status and performance monitoring, the Cheetah system will work for you now and in the future. For further information and product literature, call (941) 756-6000 today.

Cheetah™

Reader Service 91

SUPERIOR ELECTRONICS GROUP, INC.

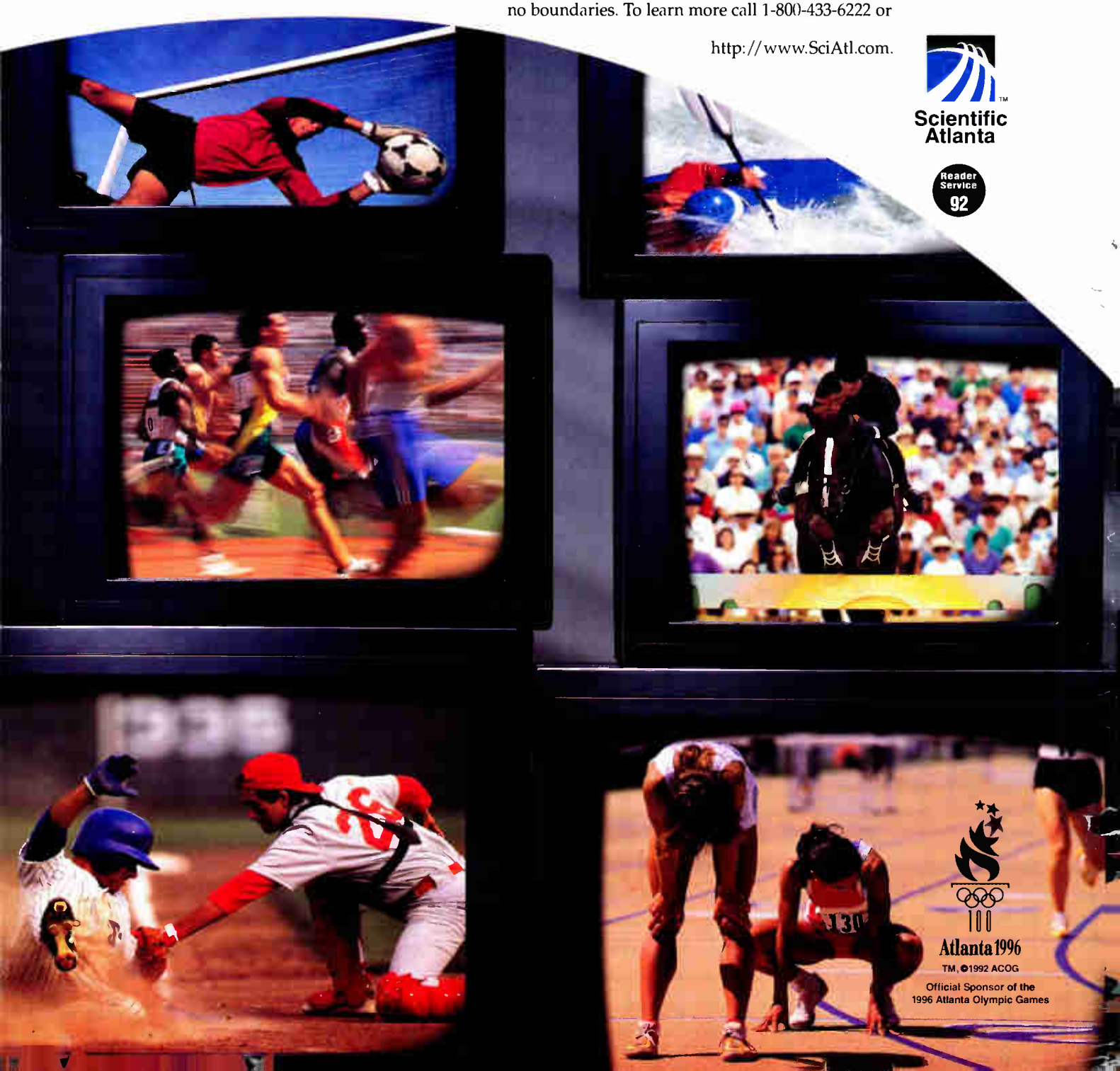
6432 Parkland Drive • Sarasota, Florida, USA 34243 • (941) 756-6000 • FAX: (941) 758-3800

ONLY ONE BROADBAND NETWORK COVERED THE 1996 OLYMPIC GAMES END-TO-END.

Soccer from Birmingham. Kayaking from Tennessee. Athletics from downtown Atlanta. Over 60 channels of live video were available to the press and broadcasters covering the Games. Thanks in part to Scientific-Atlanta, whose broadband television distribution system helped link all sports venues to key locations. And more than 6,000 Scientific-Atlanta digital communications terminals allowed viewers to watch simultaneous coverage of all televised Olympic Games activity. We like to think of it as technology with no boundaries. To learn more call 1-800-433-6222 or http://www.SciAtl.com.

Scientific Atlanta

Reader Service 92



Atlanta 1996

TM, ©1992 ACOG

Official Sponsor of the 1996 Atlanta Olympic Games