

Next Month:
Planning 2001, part two

Communications Technology

OFFICIAL TRADE JOURNAL OF THE
SOCIETY OF CABLE TELECOMMUNICATIONS ENGINEERS

OCTOBER 2000

PLANNING

2001 • PART ONE

SPECIAL REPORT

PAGES 42-90

**Enhanced Services
The Latest Applications**
page 64

**Fiber Shortage
Locating New Supplies**
page 104

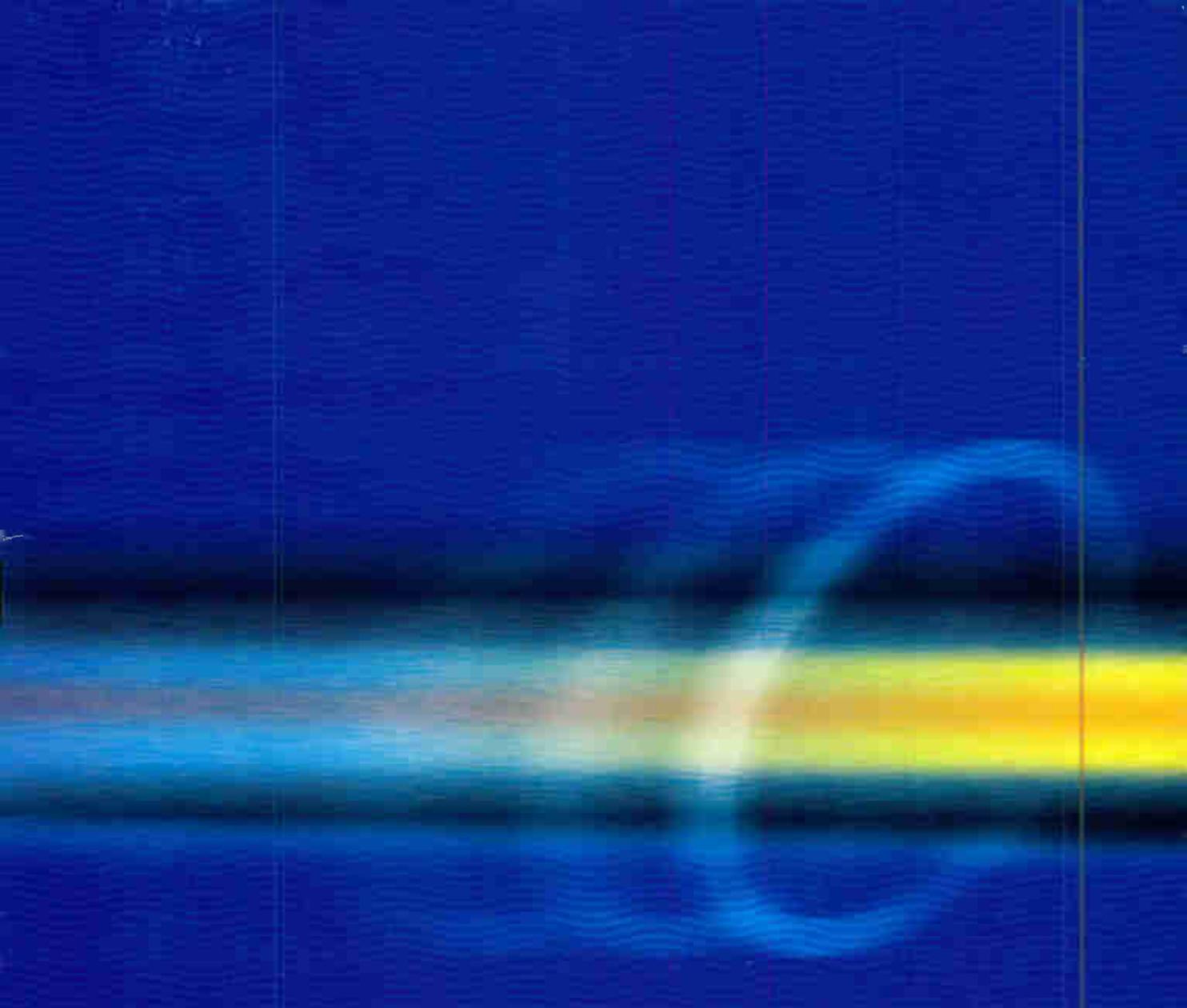
**Expansion Loops
Tips on Proper Usage**
page 122



AUTO ***** 3-DIGIT 551
667325/CB C CT 00336
FRED E MCCORMACK
PO BOX 65666
SAINT PAUL MN 55165-0666

www.cabletoday.com

Phillips



A whole new way to shoot trouble.

**One Solution.
One Company.**

On your mark. Get set. Go. High-caliber solutions are on the way. Cheetah Technologies and WWG have combined to develop a one-stop, integrated solution to streamline operations, cut costs, simplify training and improve network reliability. From managing your network to trouble shooting in the field, we've got you covered. New technology. New products. New way of thinking. Coming soon from the new Cheetah/WWG. Call us or visit us on the Web.

1-800-622-5515 • 317-788-9351 • 941-756-6000 • www.wwg-solutions.com • www.cheetahtech.com



CHEETAH
TECHNOLOGIES



WAVETEK
WADEL
SOLTERKAT II

CONTENTS

October 2000 volume 17 number 10



>>>>> **Planning 2001**
> 42-90

Planning 2001 > 42-90

In our annual two-part roundup, we offer planning strategies to help you get your plant in shape for the new year.

• **Operators' Plans > 42**

Senior Editor Natalia Feduschak reports explains why industry insiders predict next year will be a "golden era" in television.

• **Tomorrow's Headends > 48**

ADCs Sara Manderfield and Ross Ruschmeyer provide tips to ensure your system is equipped for tomorrow's technology challenges.

• **Media Streaming > 58**

Contributing Editor Arthur Cole outlines tips for easing your planning process for media streaming.

• **Enhanced Services > 64**

Philips' Jan van der Meer describes the latest multimedia apps for enhanced broadcast services with complementary delivery over IP.

• **QoS over VoIP > 74**

Cisco Systems' Mark Bakies explains how broadband operators that implement a QoS system may improve reliability.

• **Planning for PODs > 82**

Scientific-Atlanta's Anthony Wasilewski discusses point-of-deployment (POD) modules are critical to making retail set-tops available.

Video Compression > 94

ANTEC's Jim Farmer details three ways to remove frame-to-frame redundancy—one of the main sources of redundancy in picture content.

Need Fiber? > 104

Deployment Editor Jonathan Tombes offers strategies to alleviate your fiber shortage.

Fiber-to-the-Home > 114

Contributing Editor Monta Monaco Heron reports on the progress of fiber-to-the-home.

Expansion Loops > 122

CommScope's David L. Jones explains the dos and don'ts for using expansion loops in cable plant.

Network Maintenance > 130

InteQ's Bruce Bahlmann explores how today's problems with network management could propel a push for more open systems and standardization.

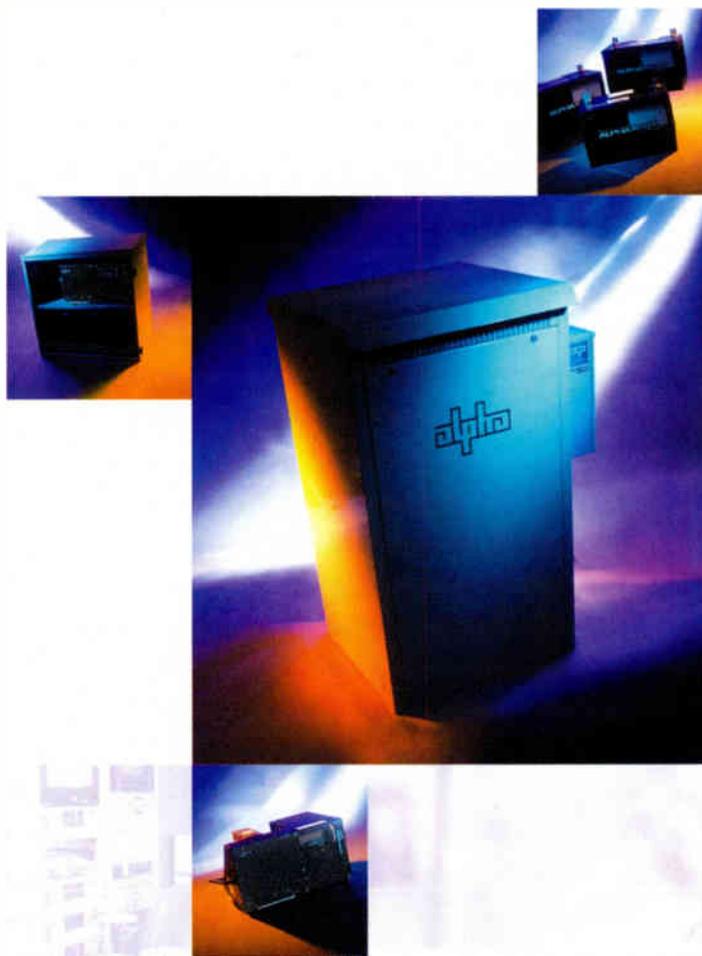
Cover

Design by Tamara A. Morris
Original photo(s) courtesy of Photodisc

© 2000 by Phillips Business Information Inc., a subsidiary of Phillips International Inc. All rights reserved. Contents may not be reproduced without permission. *Communications Technology*™ (ISSN 0884-2272) is published monthly by Phillips Business Information Inc., 1201 Seven Locks Road, Suite 300, Potomac, MD 20854, USA. Editorial and sales offices located at 5655 South Yosemite, Suite 206, Englewood, CO 80111 USA, (303) 839-1565. October 2000, Volume 17, Number 10. Periodicals postage paid at Rockville, MD, and additional mailing offices. POSTMASTER: Send address changes to *Communications Technology*, PO Box 3230, Northbrook, IL 60065-9647.

Protecting The Power In Communications.

www.alpha.com



Alpha Technologies. Empowering a revolution in global communications. Innovation and leadership from the company with nearly a million power installations in more than 50 countries around the world.

Tel: (360) 647-2360

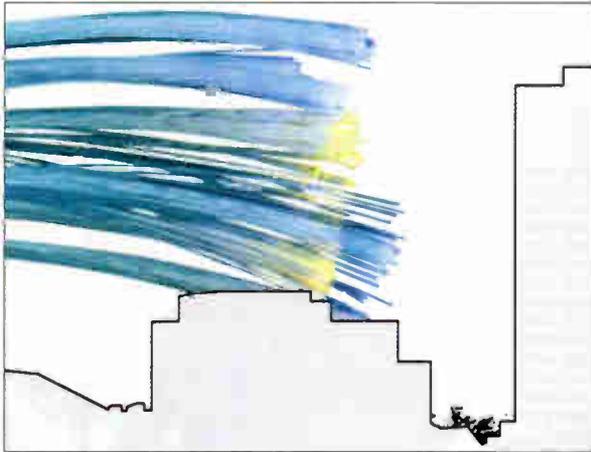
Fax: (360) 671-4936

www.alpha.com



CONTENTS

October 2000 volume 17 number 10



Fiber-to-the-Home > 114

NEWS & OPINION

Editor's Letter > 8

Pulse > 12

Marketplace > 146

REFERENCE

Training > 144

Web Connect > 160

Advertiser Access > 162

Business/Classifieds > 163

Calendar > 172

COLUMNS

Broadband > 32

CT Senior Technical Editor Ron Hranac explains babbling set-tops, transient hum modulation and other potential reverse path nightmares.

Telephony > 38

Telephony Editor Justin Junkus discusses systems integration needed to provide IP-enabled customer services.

Certification > 174

SCTE Director of Certification Gary Selwitz outlines the organization's latest Broadband Services Technician program.

SCTE Message > 178

SCTE President and CEO John Clark offers a sneak peak at Emerging Technologies 2001, to be held Jan. 8-10 in New Orleans.

Why The World Is Connecting To

Terayon:

One Name For Voice, Data And Video

One Global Solution

One Trusted Partner

We've been there when it counts, delivering cost-effective solutions to leading cable operators around the world. A broadband company with an impressive list of technologies that include high speed Internet cable access systems, integrated voice and data solutions, and digital stream management tools.

Today, Terayon is a single, worldwide source for cable, wireless, copper and fiber technology. We provide an array of standards-based and patented broadband cable access technologies. Our CherryPicker™ systems enable dynamic grooming, ad splicing and digital video re-multiplexing. Our integrated voice and data systems allow operators to deliver telephony services today, with a secure roadmap for voice-over-IP.

We're committed to maximizing bandwidth delivery to enable new value-added services and increase revenue opportunities. And we'll continue to build carrier-class voice, data and video solutions to meet the challenges you'll face tomorrow.

**Let us get to know you.
Then you'll know why we're connecting with the world.**

TERAYON

Broadband and Beyond

**For more information, contact us
www.terayon.com/cable**



The Perils of an Overbuild

There once was a time when cable operators respected each other and would never consider overbuilding another's existing system.

Back in the '70s, I had a partner with whom I owned several systems in Missouri and Colorado. I sold my ownership back to him and remained involved in two other systems in Kansas and Iowa. This partner came to me one day and said he was going to overbuild a cable system belonging to a top multiple system operator (MSO). I refused to re-partner with him. He had hardly begun his efforts, when a court battle erupted, netting him \$50 million, tax free. To this day he laughs at my "scruples." Given the choice again, I'd still choose the same.

City councils award second and third franchises with almost no thought to consequences. They state the need for "competition," but seem to forget the basics in design and construction of original cable systems—much less the aggravations when a second begins.

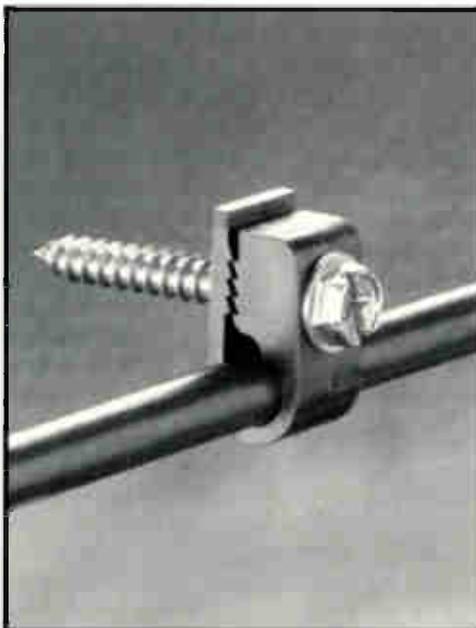
Voters will scream for another "com-

petitive" system, assuming it will magically appear. But there is only one communications space on the utility poles and utilities rent that space to the already-operating cable company. By granting a second or third franchise, the city may be opening Pandora's box. All of a sudden, construction crews arrive at Marauding Myrtle's backyard and begin to tear it up since the new system must go underground and the new guys can't get on the poles. Then, there's Battling Bob, who earlier warred with city hall over the old cable company setting a pedestal in his yard. No sooner has he become at ease with that single pedestal, the new guys tell him they need another one in the opposite end of his front yard. Okay, Mayor—get ready for Battling Bob all over again.

The original operator has located power supplies at strategic points in the city, concealed by shrubbery or flowers. By now, the public is accustomed to them, but the new group that has to install away from these locations. Feuding Fred, who never

liked anything the city did, now has an arsenal of reasons to vent his wrath at every city council meeting. But perhaps you can assure him you only did this for his own good. After all, a second or third cable system in the same city means "competition." And "competition" is good for Myrtle, Bob and Fred, whether they want it or not. But when they ask why the overbuilders don't have to attach their cables to the same poles, why their yards are being trenched all over again and why there are a multitude of pedestals and power supplies all over the place, what will you tell them? They aren't supposed to know what can happen when the city allows overbuilds. But you are supposed to know about all the chaos it can cause. Quality operators don't overbuild other operators. If you want to own an existing system, buy the system or apply for the franchise at renewal time.

If I simply wanted to ride others' coat tails, I guess I'd opt to overbuild—it's easier than paying your dues. □



Preventing Problems is easier than solving them.

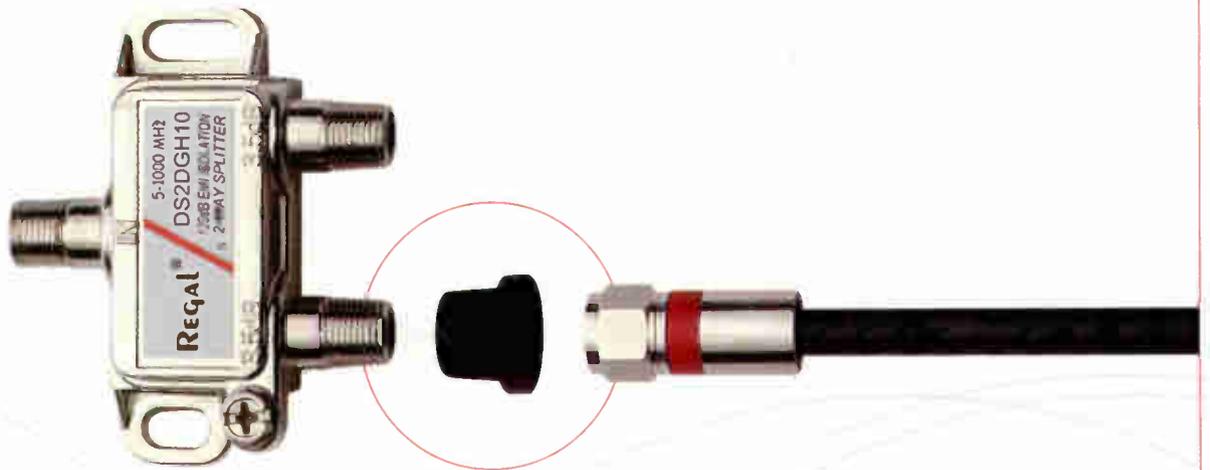
The Exceptional Flex Clip.

Telecrafter Products

Direct merchants to the telecommunications industry

800-257-2448 • fax: 303-986-1042 • e-mail: mail@dropsupplies.com

REVOLUTION



PREPARE YOUR DROP FOR ENHANCED SERVICES

DIGITAL SIGNAL RELIABILITY—CUSTOMER SATISFACTION

Telephony, data and other digital services are placing increased demands on your drop system. Why take chances with your customers' satisfaction? Regal digital-ready splitters and Digicon premium F-connectors are specifically engineered to address the unique requirements of digital signal delivery – like isolation, return loss, magnetic interference and intermodulation. Want to know more? Give us a call. Regal – the brand you've trusted for years.

1-800-353-9473

WWW.ANTEC.COM

OPTICAL

DIGITAL

ANTEC

SCTE BOARD OF DIRECTORS

AT-LARGE DIRECTORS

Chris Bowick, Cox Communications
(404) 843-7150
chris.bowick@cox.com

Tom Elliot, CableLabs
(303) 661-3788
t.elliott@cablelabs.com

Ron Hranac, Cisco Systems
(720) 875-1338
rhranac@aol.com

REGIONAL DIRECTORS

Region 1 Steve Allen, Cisco Systems
(530) 622-2856
sallen@accesspaging.com

Region 2: Steve Johnson,
Time Warner Cable
(303) 799-5621
steve.johnson@twcable.com

Region 3: Eric Brownell,
AT&T Broadband
(425) 398-6162
brownell.eric@TCL.com

Region 4: M.J. Jackson,
Alcoa Fujikura
(864) 433-0333
mj.jackson@alcoa.com

Region 5: Percy Kirk,
Cox Communications
316-262-4270
percy.kirk@cox.com

Region 6: Bill Davis,
Communications Supply Group
(612) 445-8424

Region 7: Jim Kuhns,
Terayon Communication Systems
(810) 790-7356
jkuhns@terayon.com

Region 8: Don Shackelford,
Time Warner Cable
(901) 365-1770
don.shackelford@twcable.com

Region 9: Keith Hayes,
AT&T Broadband
770-559-6807
kehayes@broadband.att.com

Region 10: Wes Burton,
AT&T Broadband
804-915-5369
wburton@broadband.att.com

Region 11: Marianne McClain,
Baker Installations
(412) 531-5710
mmclain@bakerninstallations.com

Region 12: Bob Foote, Antec
(978) 356-1395
bob.foote@antec.com

SCTE NATIONAL HEADQUARTERS • 140 Philips Road • Exton, PA 19314-1318 • (610) 363-6888

CT EDITORIAL ADVISORY BOARD

Richard Green, CableLabs (chairman)
(303) 661-9100

John Canning, Microsoft
(425) 882-8080
jcanning@microsoft.com

William Check, NCTA
(202) 775-3637
bcheck@ncta.com

Jim Chiddix, Time Warner
(203) 328-0615
jchiddix@twcable.com

John Clark, SCTE
(610) 363-6888;
jclark@scte.org

Richard Covell, TTS Inc.
(303) 646-0668
rcovell@bewellinet.com

H. Allen Ecker,
Scientific-Atlanta
(770) 903-4625
allen.ecker@sciatl.com

Jim Farmer, ANTEC
(770) 441-0007
jim.farmer@antec.com

Marty Glapa, Lucent
(303) 409-3432
glapa@lucent.com

Ron Hranac, Cisco Systems
(720) 875-1338
rhranac@aol.com

John Pietri,
Charter Communications
314-965-0555
jpietri@chartercom.com

Dan Pike, Prime Cable
(512) 476-7888
dpike@primicable.com

Bill Riker,
National Cable Center and Museum
(303) 871-3198

Geoffrey Roman, Motorola
(215) 323-1105
groman@gi.com

Mike Smith, Neptec LLC
(865) 475-4680
mikes@neptecinc.com

Tony Werner, TCI
(303) 267-5222
werner.tony@tci.com

Wendell Woody, Sprint/North Supply
(800) 639-2288
wendell.woody@mail.sprint.com

Reprints(301)340-7788, ext. 3420 List Sales(301) 340-7788, ext. 2026 Customer Service(800) 777-5006
Merchandise/Back Issues(800) 877-5188 Editorial(301) 340-7788, ext. 2072 Advertising(301) 340-7788, ext. 2004

THE DISTRIBUTOR THAT MANUFACTURES

CUSTOM FIBER OPTIC PRODUCTS



Angled & Ultra
Patchcord Experts



Custom Cable
Manufacturer



Fiber Optic
Test Equipment

FIBER INSTRUMENT SALES, INC.

Communication Fiber Optics



1-800-5000-347
Call for a free FIS catalog!

161 CLEAR ROAD • ORISKANY, NY 13424
Tel: (315) 736-2206 • Fax: (315) 736-2285
www.fiberinstrumentsales.com

Communications Technology

A CT PUBLICATIONS PRODUCT

EDITORIAL

Editor-in-Chief, Rex Porter (800) 325-0156, ext. 31
Editor, Jennifer Whalen (301) 340-7788, ext. 2057
Executive Managing Editor, Supriya Nayalkar (301) 340-7788, ext. 2072
Senior Editor, Madeline A. Feduszhak (800) 325-0156, ext. 26
Deployment Editor, Jonathan Tombs (301) 340-7788, ext. 2030
Associate Editor, Kimberly Johnson (301) 340-7788, ext. 4253
Contributing Editor, Arthur Cole
Senior Technical Editor, Ronald J. Hranac
Telephony Editor, Justin J. Junkus
Technical Consultant, Michael Smith

ADVERTISING/BUSINESS

Vice President & Group Publisher, Nancy Maynard
Assistant Vice President & Publisher, Tim Hermes
(301) 340-7788, ext. 2004
Associate Publisher, David Gillespie (800) 325-0156, ext. 20
Midwest, Mike Elmer (800) 325-0156, ext. 19
East, Sally Schofield (301) 340-7788, ext. 2060
Sunbelt/Southern CA, Lon Holland (800) 325-0156, ext. 33
Northwest U.S./Florida, Jerry Gundersen (800) 325-0156, ext. 16
Classifieds/Card Deck Sales, Keli Aarons (800) 325-0156, ext. 23
Production Manager, Joann M. Fato (301) 340-7788, ext. 2162
Administrative Assistant, Cathy Walker

DESIGN/PRODUCTION

Senior Graphic Designer, Tamara A. Morris
Senior Art Director, Mark Cavlich
Director of Magazine Production, Paul Bradley
Vice President of Publishing Operations, Janet Allen, CMP

MARKETING

Director of Marketing, Amy Fisher
Marketing Associate, Cathy Slavson
Assistant Director-Conference Services, Justine Wood
Senior Conference Marketing Manager, Melissa Henderson
Exhibit Manager, Rick Felpenn
Program Coordinator, Meredith Linker
Conference Registrar, Susan Cuevas

CIRCULATION

Circulation Director, Sylvia Sierra
Circulation Manager, Callie Botzen
List Sales Manager, Susan Incarnato
Ancillary Sales Associate, Darla Curtis
Subscription/Client Services—(800) 777-5006

COMMUNICATIONS & AEROSPACE GROUP

Senior Vice Presidents: Chris Scotton, Paul McPherson
Vice President/Group Publishers,
Nancy Maynard, Heather Farley
Vice President & Group Business Manager,
Kathleen De Franco
Assistant Vice Presidents, Tim Hermes, Joe Rosone, Seth Arenstein
Administrator, Evie Sanchez

PHILLIPS BUSINESS INFORMATION

Chairman, Thomas L. Phillips
President, Thomas C. Thompson
Senior Vice Presidents,
Roscoe Smith, Rich Eichler
Cable Group Founding Publisher, Paul R. Levine

CT PUBLICATIONS CORP.

A division of Phillips Business Information Inc.
CT Sales and Editorial Offices
5655 South Yosemite, Suite 206, Englewood, CO 80111
(303) 839-1565, Fax (303) 839-1564

CORPORATE OFFICES

Phillips Business Information Inc.
1201 Seven Locks Road, Suite 300, Potomac, MD 20854
(301) 340-1520, Fax (301) 738-8453
Magazine Group, toll free (888) 340-5075

Website: www.cabletoday.com





STANDARD
COMMUNICATIONS

STRATUM Modulators aren't this compact. Yet!

The STRATUM modulation system was designed to be the building block on which headends are built. It's extremely compact (it will save 80% more rack space than the modulators you're probably using now) and offers advanced features such as Windows®-based network control, open architecture for easy integration, and simplified EAS operation.

But those aren't its only virtues.

Because if you suddenly lose signal or power on a STRATUM modulator, for whatever reason, Standard's exclusive

Smart Link protocol reroutes the input and output signals to an integrated spare module, in about 200 ms. So there's little or no interruption in signal distribution. And no dissatisfied customers.

Before you buy another modulator, compare the specs, compare benefits, and then get your hands on STRATUM.

 **Standard
Communications**
Meeting tomorrow's standards today

www.standardcomm.com

U.S.: (800) 745-2445 • Canada: (800) 638-4741 • Europe: 44 1923 800 510 • Latin America: 55 11 3887 6598

AT&T Pounds Pavement

By Natalia A. Feduschak, Senior Editor

In its fight to win customers from the nation's leading phone companies, **AT&T** is using old-fashioned tactics like door-to-door advertising with sales people touting low prices and packaged cable services.

"We want to be the any-distance company," says Andrew Johnson, executive director of communications for AT&T Broadband in San Ramon, Calif.

"We want to be the any-distance company."

—Andrew Johnson,
AT&T Broadband

AT&T is trying to win back the customers it lost since its divestiture in the 1980s and reconnect the last "golden mile" into consumer homes, said Johnson.

To that end, AT&T has launched a massive campaign, which includes sending out sales reps to pound the pavement. In California, where the company competes against **Pacific Bell**, the efforts are beginning to pay off.

"We have been extremely gratified by the response," Johnson says. "If people wanted local phone service, they only had one place to go. Now we have real live competition."

AT&T has been able to lure customers partly because it is offering services that are up to 25 percent cheaper than the competition. PacBell has faced mounting criticism in California for poor customer relations and slow service in hooking residents up to digital subscriber lines (DSL).

"We are a less expensive product across the board," says Johnson. AT&T offers its customers traditional cable services, local and long distance service, as well as additional lines to the home for \$5 a month, he says.

Back in the USSR

Johnson admits, however, the company is not able to keep up with demand and is hampered because AT&T's service is not offered in all parts of California.

That is something Peter Bejger, a public relations consultant, found out when he relocated to the Bay area after living in Ukraine for eight years.

Plagued with problems in getting DSL service hooked up in his downtown San Francisco apartment, Bejger

gave AT&T a call. He was told the company wasn't servicing his area. Bejger is still waiting for PacBell's DSL service, which he signed up for in May.

"It's ridiculous," says Bejger, noting he received better telephone service in Kiev, Ukraine, a former republic of the Soviet Union.

Rodd Aubrey, a spokesperson for PacBell, says some of his company's problems are the result of its inability to keep up with the rate of demand for installation.

"We've gone from installing 1,100 lines a day to 3,000 a day," he says. In order to provide customers with some relief, PacBell is offering self-installation so technicians don't need to be on hand for hook-ups. In addition, to compete with AT&T's cable services, PacBell recently announced a deal with **Blockbuster** to start offering video to consumers, Aubrey says.

In other parts of the country, AT&T's campaign to win back customers presents a challenge to companies like **Qwest**, which recently acquired Denver-based **US West**.

"We're trying to be pretty deliberate in our approach," says Amy Colella, a spokesperson for the VDSL group at Qwest. She says the company has used some door-to-door advertising to win customers, but has not launched a mass advertising cam-

paign and is still deciding which approach to take in its local phone service offerings.

Despite its incremental success, one thing AT&T still hasn't been able to do is provide one bill that bundles together all the services the company offers, says Sarah Duisik, a spokesperson for AT&T in Denver.

"It's a very complicated process that we're working on diligently," she says.

NEWSBYTES

- > **Charter Hits Half Million**
Charter Communications has installed its 500,000th digital cable customer. Reps from Charter and **Discovery Networks** presented the 500,000th customer, Ida Tripoli of Burbank, Calif., with a large screen television and other merchandise. Charter's total customer base is over 6.2 million.

- > **Cablevision Launches SourceGuide**
Cablevision is launching **SourceSuite's** interactive program guide (IPG), **SourceGuide**, in its Boston system. **SourceSuite** is a joint venture between **Source Media** and **Insight Communications**. Its server-based program guide offers such features as personalized programming, on-screen reminders and parental locks.

- > **DISH Dishes Service**
J.D. Power and Associates' "2000 Cable/Satellite TV Customer Satisfaction Study" ranks **EchoStar's** **DISH Networks** as the leader in customer satisfaction in the pay-TV industry (satellite and cable). **EchoStar** says that it performed strongly in all factors, especially cost of service and program offerings.

ComSonics Inc.

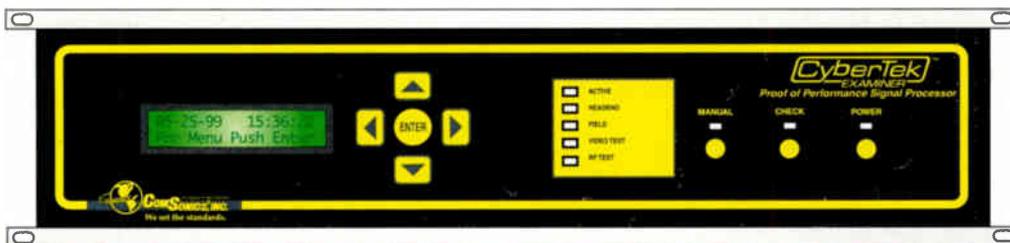
We've set another Test Equipment Standard!

Introducing

CyberTekTM

EXAMINER

Proof of Performance Signal Processor



- Allows Proof of Performance (POP) FCC required tests any time, day or night.
- Tests are performed without viewer interruption.
- Signals provided for the following tests: Carrier to Noise, Composite Triple Beat, Composite Second Order, in-band flatness, and spurious signals.
- Also, provides signals for FCC required Head End video tests.
- Automatic, unattended sequencing of the required test functions without standby Head End personnel.
- Eliminates the need for communication between Field Technicians and the Head End while making measurements.
- Capable of providing test signals on 12 channels.
- Rack mountable for convenient, permanent installation in the Head End.

Use it as a routine maintenance tool... and guarantee quality system performance.

...Another Innovation from the Cable Industry's Test Equipment Leader

P.O. Box 1106 • Harrisonburg, VA 22801 USA
(540) 434-5965, In USA: (800) 336-9681 Fax: (540) 432-9794
or visit our web site at <http://www.comsonics.com>
email: marketing@comsonics.com



COMSONICS, INC.
An Employee Owned Corporation
We set the standards.

C-COR.net/Micromuse Speed Operator Shopping

By Kimberly Johnson, Associate Editor

A resell agreement with **Micromuse, Inc.** is strengthening **C-COR.net's** strategy to become a one-stop-shop for cable operators while also charting the course for what some say will become an industry standard.

"By being a jack-of-all-trades, a single vendor can avoid the blame-game and concentrate on the problem itself."

—Carrie Packer, **C-COR.net**

Micromuse's Netcool network fault management software will now be available through systems integrator C-COR.net after the two parties entered into an August resell arrangement. The deal is a major first step for Micromuse to enter the cable arena by applying its telecom products in solving cable-networking problems.

By integrating multiple components found in networks in order to ease operation, Netcool software normalizes graphical user interfaces (GUIs) and

de-duplicates network events. The software receives industry nods for being an out-of-the-box solution, installed after a network is in place.

"Our agreement with C-COR.net has the potential to set a standard for the broadband industry as it signals the development of a single-vendor integrated solution for end-to-end management of all network domains," says Stan Sands, vice president for cable strategies at Micromuse.

The addition of the Netcool software to C-COR.net's arsenal of network management tools is expected to further its strategy of becoming a sole source for cable operators beleaguered by the complexities of network problem-solving.

Cable operators prefer having one vendor responsible for network design, hardware-building, product and service deployment, capacity-planning and overall network management, Carrie Packer, vice president of C-COR.net's Broadband Management Service Group, says. "It takes the headache away."

C-COR.net manages networks in their entirety, including analog and digital portions, and can provide an integrated look into a system, Packer says. If a problem were discovered, the operator would have the option to send out its own technicians, or reps from C-COR.net. Operators want this all-in-one, single-vendor service because it heads off confusion that can occur when dealing with several contractors, she explains.

"When there's a problem in the network, that's when the fingers start to point," Packer states. By being a jack-of-all-trades, a single vendor can avoid the blame-game and concentrate on the problem itself. "Standardization is essential for our overall solution," Packer adds.

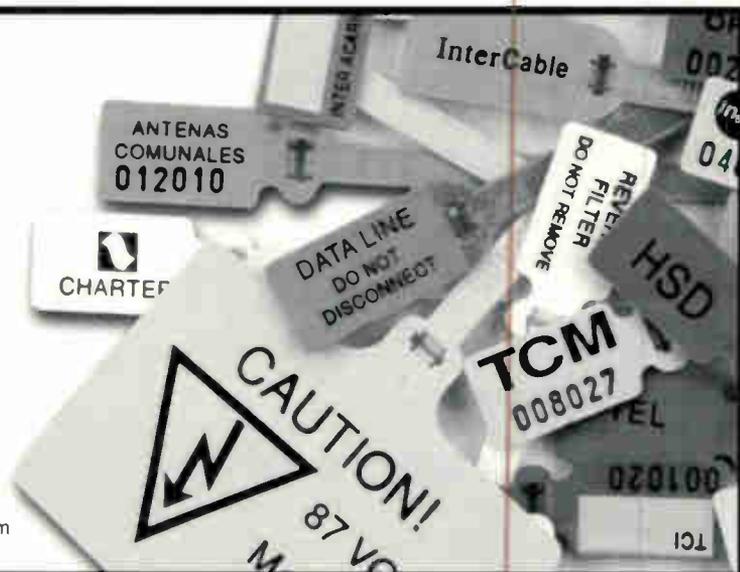
While reselling Micromuse software is not a new idea, introducing Netcool's capabilities to the cable industry is, Lawrence Harris, vice president and telecom analyst for **Josephthal & Co.**, says. "There haven't been many companies that have seized this opportunity in the market," Harris says, adding C-COR.net is in the lead because there is currently "no clearly defined competitor."

If we don't have
exactly the cable marker
you need...
we'll make it for you!

Telecrafter Products

Direct merchants to the telecommunications industry

800-257-2448 • fax: 303-986-1042 • e-mail: mail@dropsupplies.com



Now There's One Instrument That Has QAM, Sweep, Spectrum and SLM Capabilities.

Chances Are You Already Own It.



If you own a Stealth, you're a simple upgrade away from its new, more powerful form—the Stealth Digital Analyzer or SDA. The SDA combines QAM technology (64/256 measurement options), digital return and cable modem analysis and all current Stealth features into a one-box solution. So now you don't have to spend loads of money on new,

separate QAM testers. And your field technicians can spend more time fixing problems instead of running back and forth to their truck or learning new equipment. To learn more about upgrading to, or buying the new SDA, visit www.globalsolutions.com or cheetahtech.com or call **317-788-9351** or **941-756-6000**.



The new global force dedicated to your success.
Coming Soon! www.power2lead.com

nCUBE Gets Picked, On-Demand Sector Heats Up

By Jonathan Tombes,
Deployment Editor

Enron and Blockbuster have agreed to use nCUBE's video-streaming platform in their planned deployment of on-demand entertainment to consumer televisions over digital subscriber (DSL) lines.

Not as far along in the cable industry as other video-on-demand (VOD) technology providers (see related story, page 24), nCUBE would get a

simultaneous 3 Mbps streams and that its hypercube interconnect architecture enables up to 256 of its MediaHUB computers to function as one.

The Enron-Blockbuster is a case study itself. Natural gas pipeline provider Enron leveraged its rights of way into a fiber-optic backbone and is now extending its reach to the last mile through telco partners such as **SBC Communications, Verizon, Qwest, Covad, Telus and ReFlex.**

The leader in the video-rental business that has

matured into an \$11 billion industry, Blockbuster is bracing for competition from cable VOD services with its exclusive 20-year deal with Enron Broadband Services.

"This is going to drive the business case for telcos

to get into the video world," Lauren Landfield, research analyst with investment bank **Chase H&Q**, says.

More direct competition

But cable isn't the only competitor Enron-Blockbuster has to face. In August, broadband content provider **Intertainer** allied itself with **Akamai Technologies**, whose international network of some 4,000 servers and its Internet savvy make it a powerful distribution partner.

Analysts note that while Blockbuster has strong brand and distribution assets, Intertainer already has licensed content from nearly 70 media companies.

On the other hand, Blockbuster has

a powerful historical relationship with Hollywood. "Intertainer can in no way match that," says Paul Palumbo, analyst with **DFC Intelligence**. He also notes that the studios are carefully scrutinizing all VOD deals.

Intertainer has been in test markets for two years and is commercially available in Cincinnati through **Broadwind**, and in Denver through **Qwest**. It has also announced that it is participating in **Comcast's** VOD trials.

Steve Shine, Intertainer senior VP of corporate development and strategic planning, says that his company has collaborated with **Concurrent** and **Seachange** to work out user interfaces for digital set-top box applications. Theoretically, a cable subscriber could receive the service both over an advanced set-top and a cable modem.

Akamai's immediate ability to speed deployment made it the right partner for Intertainer, Shine says.



Photo courtesy of WireRx

(l to r) James D. Gallimore, SBC Strategic Marketing's executive vice president; John Antioco, Blockbuster's chairman and CEO; Kenneth L. Lay, Enron's chairman and CEO; and Fred D'Alessio, Verizon's president of advanced services.

push if this deal goes through.

"This is not a couple of small servers that they're talking about buying," says Dan Scheeran, nCUBE's senior vice president of project management. "It's a very significant investment."

Is the cable industry missing something?

Founded in 1983 to develop parallel processing computer systems for the engineering and scientific markets, nCUBE is deploying its technology in the broadband arena with its MediaCUBE 4 server system, which features a modular, scalable architecture and advanced single-chip processors.

The company says that each MediaHUB computer can deliver up to 172

NEWSBYTES

> **Millionth Terayon Modem**
Terayon has shipped its one millionth cable modem. Terayon first produced its cable data system in 1997. Its broadband portfolio includes delivery of voice, data and video services over cable, telco and satellite networks.

> **FCC Approves Pronto**
The **Federal Communications Commission** will allow **SBC Communications** to offer digital subscriber line (DSL) service from neighborhood gateways, deployed as part of the company's \$6 billion Project Pronto initiative. These gateways will push capabilities housed in central offices closer to consumers, thus removing current DSL distance constraints.

Fluent in DigiCipher®



Digitrans now offers a fully-compatible DigiCipher II® reception and decryption solution — the DTE-7100 — creating a truly open cable environment.

Talk about advantages

You'll appreciate the 7100's seamless operation with your existing DigiCipher II equipment. Its straight-forward menu speaks volumes about its credentials while the single-rack design fits your headend space requirement.

Talk about simplicity

What you'll admire most is the architectural sim-

licity that eliminates scrolling through interminable menus for even the most basic of operations. And how critical parameters such as symbol rate and FEC are determined automatically.

Talk about reality

After two years in development and successful commercial use, the DTE-7100 is now available to cable networks and program providers worldwide. For more information or a demonstration that will make you more fluent in DigiCipher, call 800-756-3147.

Or check our web site at www.digitrans.com



DIGITRANS
DIGITAL TRANSMISSION EQUIPMENT

Digital solutions simplified.

Lightchip Gets ANTEC Contract, Funding

By Jonathan Tombes, Deployment Editor, and Cindy Dubin, Contributing Editor, Fiber Optic News

ANTEC is spending \$25 million for two-way, multi-wavelength optical routing equipment from **Lightchip Inc.**, an optical transport and management systems provider.

"Lightchip provides us with a revolutionary dense wavelength division multiplexing (DWDM) infrastructure for optical routing and management that creates the optical foundation for ANTEC's Transplex system," Bob Stanzone, ANTEC Network Technologies president and CEO, says.

Stanzone says Lightchip's optical management capability, incorporated into ANTEC's 1550 nm optical transmission systems, enables high-level status monitoring of channels. "This unique solution provides continuous predictive failure capability," he says.

The ANTEC-Lightchip partnership debuted this summer with ANTEC's Lightplex system, consisting of passive DWDM devices and an optical performance manager (OPM).

Why the emphasis on network management?

"Convergence is an issue," says Immanuel Vella, vice president of product management for ANTEC's active electronics. "If you want to make your system telco-grade, if your wavelength is drifting, for whatever reason, or dropping out, you need to be able to monitor that and alarm it appropriately."

Third-round financing

ANTEC isn't the only one noticing the Salem, N.H.-based Lightchip. On the same day that news of the \$25 million ANTEC contract broke, Lightchip announced that it had completed a third round of financing worth \$60 million. **Berkeley Interna-**

tional Capital of San Francisco led the financing with continuing participation by **Morgenthaler Ventures**, **AT&T Ventures**, **LightPath Technologies**, and **J.P. Morgan Capital**.

The company will use its financing to accelerate the implementation of its production facilities and to expand product development and its marketing and sales programs. This third round brings the total investment received by Lightchip since its founding in 1998 to \$85 million.

Lightchip gained momentum with its June launching of the Versalight family of optical transport and management products. Versalight products, targeted to equipment vendors, can transport any combination of traffic, from analog video to high bit-rate synchronous optical network (SONET), bidirectionally over a single fiber strand, with continuous optical performance monitoring at all nodes.

"Companies are looking for a total solution and our challenge is to very aggressively and controllably increase our manufacturing capacity to meet that exploding demand," says Bill Emkey, vice president of marketing at Lightchip. "This space has not been addressed to the depth and breadth as it should be as DWDM grows to higher channel counts."

Before joining Lightchip in July 1999, Emkey managed the global market development group for **Lucent Technologies** opto-electronics, focusing on video/broadband applications. Prior to that, he worked for **Bell Laboratories**, where he managed several opto-electronic development groups responsible for the development of optical components.

In an effort to keep up with demand, Lightchip expects to double its number of employees from 85 within the next year.

DEALS

> *Charter Adds Kalamazoo*

Charter Communications completes its acquisition of **Cablevision's** Kalamazoo, Mich., cable system in a stock deal worth 4170.6 million. Charter gains approximately 48,600 customers in the deal.

> *Lucent, Omniplex Agreement*

Lucent Technologies and **Omniplex Communications** announced a multimillion dollar agreement for Lucent to build and maintain a broadband network that will enable Omniplex to deliver voice, data and Web services to business customers.

> *Financing for iVAST*

iVAST, a developer of interactive streaming media technologies based on MPEG-4, secured \$8.5 million in financing from venture capital firms and strategic investors, including **BCE Capital**, **Centennial Ventures**, **Vanguard Venture Partners**, **Venture Strategy**, and **Vulcan Ventures**.

> *Motorola Buys Printrak*

Motorola and **Printrak International** signed an agreement whereby Motorola will buy the Anaheim, Calif.-based supplier of software.

> *Sybergen, Intersil Join Forces*

Sybergen Networks, a provider of Internet security and access management solutions, will develop software to work seamlessly with a chip set produced by **Intersil**, a developer of silicon technology for wireless local area networks (WLANs), to provide access to broadband services in homes and offices.

We just turned the Art of Testing Cable Modems... into a Science



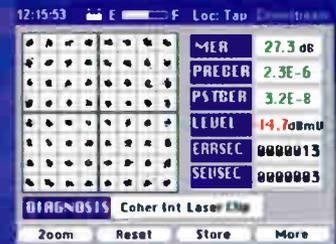
THE NEW HUKK CM1000 Cable Modem System Analyzer

**Exclusive Upstream
BER Testing**

- BER, MER, Level and Constellation on the Downstream
- BER, Attenuation, and Lost Packets on the Upstream
- Full Color Display Indicates Problem Parameters in Red
- 10 Base T and USB ports for Computer Connection
- Durable, Modular, Handheld Unit



Upstream Display



Downstream Display

Now cable technicians can test the performance of DOCSIS Cable Modem Systems on both the downstream and upstream paths. With the CM1000 there's no more shotgun approach to cable modem installations. No more wholesale replacement of drop cables, splitters and internal wiring just because there is no good way to tell the installation's performance. The new **Hukk CM1000 Cable Modem System Analyzer** will fully characterize the installation, and if problems are found, accelerate problem isolation so techs only replace what is necessary so they can quickly move on to the next call. The increased efficiency of the technician should pay for the cost of the instrument in short order. In addition, the **CM1000** eliminates the need to fix subscriber's computer problems because for the first time, cable companies will be able to prove that their system meets minimum standards. This is especially important when subscribers own their own cable modems.



**Free online seminars
available at www.hukk.com**

3250-D Peachtree Corners Circle
Norcross GA 30092
Phone: 888.236.8948
770.446.6086
Fax: 770.446.6850
www.hukk.com



A Sunrise Telecom Company

After A Lull, A Telecom Lion Roars

By Natalia A. Feduschak, Senior Editor

This is a busy time for AT&T Broadband.

After a period that saw little activity from the telecom giant, AT&T entered into several agreements with the country's largest suppliers of cable modems and digital set-top boxes, plus unveiled a campaign to introduce uniform pricing and packaging of digital cable products.

"I certainly think what AT&T has done here is to make a commitment about rolling out new advanced services," Dan Moloney, senior vice president and general manager of Motorola's IP network systems business unit, says of the recent deals. "At a high level, this is a statement by AT&T that they are committed in moving forward with the advanced services they have been talking about."

Most significantly, AT&T reached a comprehensive video, voice and data supply memorandum of understanding with Motorola Broadband Communications Sector to buy 700,000 Motorola cable modems through the end of next year, along with a commitment to deploy Motorola's cable modem termination system (CMTS) equipment.

IP trials planned

In addition, Motorola will be an initial provider of voice-over-Internet protocol (VoIP) technology. AT&T plans to launch Motorola's Switched IP access solution in two major markets and has promised to buy Motorola's CentriQ customer premises equipment (CPE). The company expects to begin a trial deployment of Motorola's Switched IP access solution later this year, says Tony Werner, AT&T Broadband's chief technology officer.

AT&T will also purchase 700,000 RCA-brand high-speed cable modems from Thomson, and plans to market Philips Electronics' advanced digital

cable set-top boxes to U.S. consumers beginning in 2001.

The purchases will help AT&T Broadband move into the retail space, a sector to which the company is very committed, Werner says.

"That's a channel that we have to be aggressive in and is great for consumers."

Individual packaging

Hoping to better its position in the marketplace, AT&T Digital Cable also unveiled digital value packages in some parts of the United States, allowing customers to select programming packages that target their individual interests. The new packaging is expected to be available in all AT&T cable services systems nationwide by late 2001.

Unifying the offerings will form a basis from which to offer multiple products—including interactive services, high-speed cable Internet access and digital phone service—bundled together as they continue to be deployed nationwide.

Quiet period

The deals come after an unusually quiet period for AT&T, which raised concerns that following its \$100 billion acquisitions of TCI, MediaOne and other smaller operators, the company was not up to the task of delivering the services it promised. AT&T has seen its stock price fall and long distance profits falter.

Despite recent agreements, it is still unclear whether AT&T will be able to meet its goal of signing up 500,000 telephony service subscribers by the end of the year.

"They totally laid low," says Keith Kennebeck, a cable analyst for Washington, D.C.-based The Strategis Group. "This is the most valuable name in telecom. They didn't want to have all these bad experiences leak over."

Still, Werner is optimistic about the fu-

ture and says the agreements will allow the company to face future challenges.

"AT&T Broadband is continuing to execute on delivering video, voice and data services to our customers nationwide," Werner told journalists recently. "We need great companies to work with us to meet today's promise and to help us to innovate for tomorrow."

PEOPLE

> *Dukes Elected Chairman*

Stephen D. Dukes, a pioneer in data-over-cable broadband technology and the development of DOCSIS specifications, was elected chairman of the technical advisory board for Cadant. He previously served as CEO of MCNS Holdings and as a member of the CableLabs DOCSIS Certification Board.

> *Jonathan Levin Honored*

Chairman and CEO of Time Warner Gerald M. Levin donated \$10 million to the National Cable Television Center and Museum in honor of his late son, Jonathan M. Levin. The gift will fund a programming leadership endowment and a university chair in programming.

> *Woodle Elected Chairman*

David A. Woodle, president and CEO of C-COR.net, has become chairman of the board, succeeding Richard E. Perry, who is retiring from the company.

> *Birck Tells Chairman*

Tellabs CEO Michael J. Birck, one of the company's original six founders, was named chairman of the board of the directions. Former Ameritech chairman and CEO Richard C. Notebaert was named president and CEO.

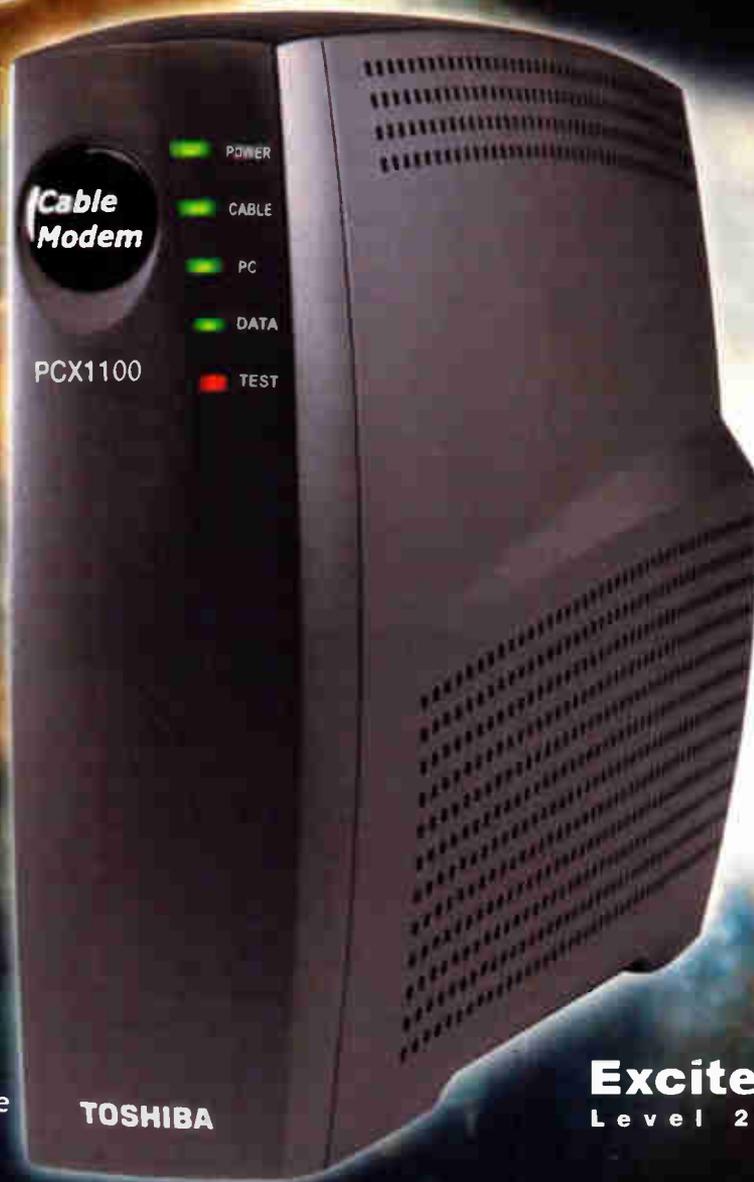
Engage!

Toshiba PCX1100 DOCSIS™ Cable Modem

- New technology delivering up to 40% **FASTER** transfer rates
- DOCSIS 1.1 based
- CableLabs® Certified™
- Excite@Home® Level 2 Approved
- Fast sync-up for shorter installation times
- Proven Toshiba stability and reliability
- Superior training and support programs
- Self-installation and advanced diagnostics software
- Field upgradeable firmware

Energize your cable modem business.

The powerful and reliable new Toshiba PCX1100 cable modem offers DOCSIS™ 1.1-based capabilities and even better performance than any previous model. Superior stability and reliability ensure unsurpassed performance, backed by dependable Toshiba training and support. The PCX1100 is CableLabs® Certified™ and Excite@Home® Level 2 Approved, demonstrating that it meets the rigorous interoperability requirements of the DOCSIS standard and the Excite@Home Network. Plus, its field upgradeable firmware should make the switch to DOCSIS 1.1 services a snap. Toshiba's legendary engineering and advanced features make installation fast, easy and less costly. Fewer truck rolls and shorter installations become the norm! Enjoy the benefits of a smoother-running, more profitable network, and use Toshiba's advanced diagnostic tools to keep it that way.



Excite @ Home
Level 2 Approved

Make contact!

Experience the power first hand. Contact us today to schedule a personal test flight of the Toshiba PCX1100 DOCSIS cable modem.

In Touch with Tomorrow
TOSHIBA

<http://internet.toshiba.com>
cablesales@networks.toshiba.com
949-461-4840

© 2001 Toshiba America Information Systems, Inc. All rights reserved. The CL, CABLELABS, CERTIFIED and Designmark and the terms "CableLabs Certified" or "Certified by CableLabs" are certification marks of Cable Television Laboratories, Inc. and cannot be used without authorization of Cable Television Laboratories, Inc. Excite@Home is a trademark of AT Home Corporation, and may be registered in certain jurisdictions.

Innovative Upconversion

By Jonathan Tombes,
Deployment Editor

A revolutionary down-sized upconverter from **Broadband Innovations Inc.** has generated both buzz and bucks. And more business opportunities than the San Diego-based radio frequency (RF) design house can handle.

The buzz comes from transforming an otherwise “boring” piece of equipment. “They’ve developed some unique approaches to doing something that is not new,” says Dean Rockwell, general manager of **Scientific-Atlanta’s** headend systems division.

S-A not only purchased the mod-

Broadband Innovations’ “upconverter is probably a quarter of the volume and half the area of typical implementations.”

—Dean Rockwell, S-A

ule, but also incorporated it right away into a new product, the UC-4 Universal Upconverter, which it launched at this summer’s Cable-Tec Expo. Then S-A led a round of investment funding that brought BBI \$11 million.

What BBI has done is solve space and power constraints that loom large if subscriber growth and advanced services, such as video on demand (VOD), scale up as many anticipate. The company realized that the status quo on upconverter technology had to be challenged.

“S-A was our competitor, actually,” says BBI president Stephen Stuut. “They looked at ours, looked at theirs, looked at what they were developing and said, ‘Well, we’ll buy yours instead. We’ve got other things our engineers could do.’”

Using application specific integrat-

ed circuitry (ASIC) and new approaches to tuning and synthesizing, BBI’s engineers achieved a dramatic reduction in size and power require-



S-A’s UC-4 Universal Upconverter contains Broadband Innovations’ efficient upconverter modules.

ments. “Their upconverter is probably a quarter of the volume and half the area of typical implementations,” says Rockwell.

Power consumption has dropped to between one third and one half of the industry standard devices, says Rockwell. And that means lower temperatures, which correlates with higher reliability—in this

case, a mean time between failure (MTBF) for BBI’s upconverter card greater than 300,000 hours.

Plotting the terrain

A BBI chart plotting density and power consumption of cable TV upconverters lays out the competitive terrain against the requirements of a mature VOD application.

BBI chief technology officer Ron Katznelson points to a red diagonal line on the logarithmically scaled scatter plot that represents the 1.6 kW per cabinet when fan cooling is required.

A parallel line at 8 kW per cabinet represents the point beyond which the device is “smoking already,” or requires another type of cooling system.

“The direction one wants to move is down the slope along the constant redness line, which means you’ve got to dissipate less channel per channel

and provide more channels per rack unit,” says Katznelson.

The mature VOD requirement domain begins at 40 channels per rack and 1 kW per channel. No one is anywhere near to that, yet. But BBI appears to be leading the pack.

Katznelson

adds that the upconverter requirements hold regardless of deployment strategy. Whether on demand transmission is handled via a dedicated cable VOD system or over IP through a cable modem termination system (CMTS), BBI still holds a winning hand.

Not surprisingly, others are paying attention to BBI’s proprietary ASIC and other technology—its frequency agile amplifiers, printed filters and low phase noise synthesizers. **SBC Communications**, for instance, joined S-A and **Motorola** in the July investment round.

Stuut says that the BBI team has more opportunities to apply its technology than it can handle. “We’re going to stick to our knitting initially to make sure that we meet the needs of our current customer set in the cable area, but we will be doing other things.”

PEOPLE

> **Isaacs Named Prez**

Bryan K. Isaacs became president of the **Network Technologies’** product offerings at **Antec Corp.** He replaces Jack Bryant.

> **Borota Joins NetSpeak Board**

Mark Borota, senior vice president and general manager for the core networks group of **Motorola’s** global telecom solutions sector, joined **NetSpeak’s** board of directors.

The new DUC-100 Dual Channel Upconverter from DX provides a comprehensive solution for all of your analog and digital needs. With its low phase noise specification and unique bandpass filter technology, the DUC-100 Dual Channel Upconverter represents a powerful addition to your headend configuration delivering unsurpassed performance. Additional features include a digital channel display, automatic and manual gain controls, plus an optional remote interface. A complete solution conveniently designed to fit into a 1 1/4" rack space.

THE CHOICE FOR DIGITAL UPGRADES



For years you've depended on DX for the finest satellite products and we've always delivered. For vital statistics on the DUC-100 and to receive a full product brochure on our family of products call DX today.



DX Communications
A Division of Advanced Media Technologies, Inc.
1520 S. Powerline Rd., Suite F
Deerfield Beach, FL 33442
(888) 293-5856
(954) 427-5711
sales@dxcomm.com



VOD Sees First Wave of Deployments

By Arthur Cole, Contributing Editor

The leading video-on-demand (VOD) system providers have taken to the field in what looks to be a very fast-paced and furious battle over market share.

With only a tiny fraction of broadband service customers actually wired

subscribers with VOD service by the end of the year. Concurrent has supplied Time Warner with 36 MediaHawk servers that will be deployed at 34 hub sites and two regional head-ends. The Tampa Bay system has nearly 1 million total customers.

Concurrent has also deployed in

Time Warner's Hawaii system, as well as Cox systems in Phoenix and San Diego. User rates in these systems were unavailable.

• **SeaChange Inter-**

national, which has already seen a number of deployments worldwide, marked its entry in the U.S. recently with a launch at Time Warner's Austin, Texas, system. To date, more than 50,000 subscribers have access to the system, and plans are to expand the service to the system's 80,000 Explorer 2000 customers on a hub-by-hub basis. The Austin system has more than 400,000 total subscribers.

• **Diva Systems**, meanwhile, is operating in several plants across the country. The company has deployed in **Charter Communica-**

tions systems in Atlanta and Los Angeles, and is planning a fourth quarter launch on **AT&T Broadband** in Atlanta. Systems are also operational in Rockford, Columbus and Evansville, Ohio. The company reports it has more than 30,000 active subscribers in all.

• **nCUBE** has not announced any commercial launches to date, but is conducting trials on a number of leading systems and is expected to announce deployments in the near future.

The central question on most industry observers' minds is whether this space can support this many competitors. Since VOD systems are just scratching the digital cable surface, it is likely that there will be plenty of room to support all vendors for some years to come. At some point, however, a consolidation seems inevitable.

"Historically, there have been at least two players in any given technology category," said Ed Delaney, vice president of marketing and business development at SeaChange. "You see this in the cable modem space, the set-top box space, the ad insertion space. There has always been a dominant player and a minority player and maybe a third player to keep them both honest."

"There may be room for four here," he added. "We'll have to wait and see."

The key factors in determining winners and losers in the VOD market are the vendor selections by the major MSOs. Time Warner has so far split its major deployments between Concurrent and SeaChange. Time Warner officials have publicly said the strategy is to ensure that there are at least two competitors in the market.

Should the other MSOs divvy up the pie among several vendors as well, there may well be room in this market for all.

"Historically, there have been at least two players in any given technology category."

—Ed Delaney, SeaChange

for VOD, manufacturers are getting ready for a wave of new systems launches starting in the fourth quarter of this year. Expect 2001 to be a pitched battle over deployments in the hopes of gaining the most market share and bragging rights as the industry's top dog.

At press time, the leading VOD vendors were reporting the following deployments:

• **Concurrent Computer Corporation** had launched its MediaHawk system at **Time Warner's** Tampa Bay, Fla., system. The goal is to set up roughly half of the system's 35,000 digital

DEPLOYMENT WATCH MONTHLY UPDATE

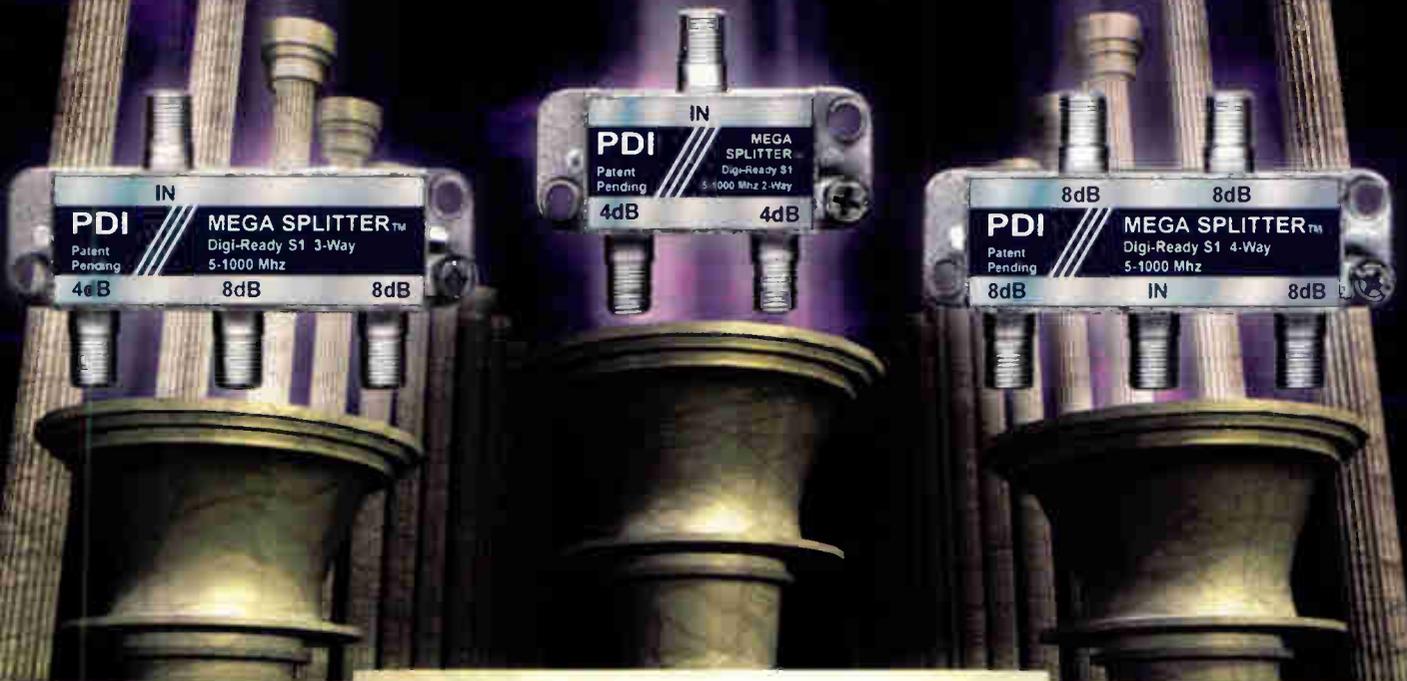
| Provider/Operator | Service/Feature | Communities | Vendor/Partner |
|-------------------------|--|--|-----------------------------|
| AT&T Broadband | Cable services | Corpus Christi, Texas | Texas Cable Partners |
| ISP Channel | Internet-over-cable services | 150,000 homes passed in U.S., Puerto Rico, and Canada | U.S. Cable |
| Liberate Technologies | Software platform for interactive services | Boston area | Cablevision |
| Marconi | Digital loop carriers | Northeast and Mid-Atlantic service area | Verizon Communications |
| Omniplex Communications | Broadband network for voice, data and Web services | St. Louis, Kansas City, Mo., Kansas City, KS, Rockford and Springfield, Ill. | Lucent Technologies |
| Pathnet | Telecommunications products and services | Durango, Colorado and the Four Corners region | Brainstorm Industries, Inc. |
| SourceSuite | Interactive program guide (IPG) | Boston area | Cablevision Systems Corp |
| Time Warner Cable | Video-on-demand | Tampa Bay, Florida | Concurrent Computer |

PDI'S DIGITAL MEGA SPLITTERS™

THE ULTIMATE IN DIGITAL PERFORMANCE

PDI's AWARD WINNING SPLITTER LINE OFFERS THE PROTECTIVE FEATURES YOUR BROADBAND NETWORK REQUIRES.

6KV SURGE PROTECTION
360° CENTER SEIZURE MECHANISM
VERY LOW INTER-MODULATION DISTORTION
40dB MINIMUM RETURN PATH ISOLATION
BLOCKING CAPACITORS ON ALL PORTS
UNIQUE HEAVY DUTY CANTILEVERED HOUSING



PDI - Electronics For
Telecommunications
6353 West Rogers Circle - Bay 6
Boca Raton, Florida 33487

Web Site: www.pdi-efl.com
E-mail: PDI.Electronics@worldnet.att.net
Hablamos Espanol y Falamos Portugues

Toll Free: 1-800-242-1606
Local: 561-998-0600
Fax: 561-998-0608

WIRELESS BROADBAND APPLICATIONS



YOU DECIDE
THE
REQUIREMENTS...

POINT TO POINT  POINT TO MULTIPOINT

ONE WAY  TWO WAY

DIGITAL  ANALOG

DIGITAL
and
ANALOG

WE PROVIDE
THE
SOLUTIONS.

Cable AML

Tel 702.363.5660
Fax 702.363.2960
sales@cableaml.com
www.cableaml.com



Cable AML, the world leader
in broadband microwave

PULSE

Liberate Packs in Variety

By Jonathan Tombes,
Deployment Editor

Time-to-market is the latest mantra at **Liberate**, whose PopTV's Variety Pack is designed to spur the adoption of its interactive-TV operating platform, or middleware.

Variety Pack is a set of pre-packaged but continuously changed-out content that enables Liberate to demonstrate its technical capabilities in a real-life situation. The content comes from several dozen content providers, such as such as **Bloomberg, Hollywood.com, Life-time, PBS** and the **Weather Channel**.

"It's all about leveraging relationships," says Erik Smith, Liberate's director of developer relationships. Liberate is offering Variety Pack free to operators during six-month trials of its middleware product.

Middleware remains a "theoretical working solution," Steve Heeb, senior director of new business development at **Comcast Cable**, says. Before he makes any big purchases, he adds, the software and hardware vendors have to "prove it works."

Apart from Liberate, other middleware providers include **Canal Plus, Microsoft, OpenTV** and **PowerTV**. The product, by definition,

remains somewhat hidden within the set-top box.

"The end user's not going to know, 'Oh, this is Liberate software, this is OpenTV software,'" says Mary Joyce Scafidi, senior analyst with technology research firm **IDC**. Expectations will nonetheless be high.

Scafidi poses this worst-case viewer scenario: a new digital cable TV subscriber surfs through the line-up, only to find no enhanced programming and no hyperlinks.

"You want as much content and as many applications and really good electronic program guides (EPGs) to make it worth paying your monthly fees," Scafidi says.

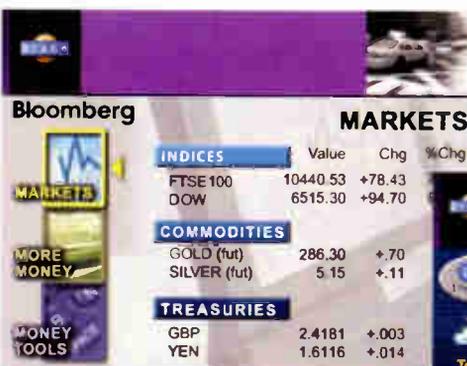
Heeb emphasizes that the Liberate application is TV-centric. "This is not a Web site shown on TV."

Content providers are just as motivated as operators to give the viewers who trial these new services a good experience. Brand extension is the name of the game.

"With just a click of the remote control, Variety Pack subscribers will receive interactive content and information about a favorite PBS program," says Tom DiGiovanni, director of enhanced programming for PBS, in a statement.

"What better way to underscore our commitment to quality programming and to encourage viewers to 'stay curious,'" he adds.

Bloomberg (left) and eLocal (below) are Liberate PopTV Variety Pack partners.



Billing Services Key for MSOs

By Natalia A. Feduschak, Senior Editor

In an era where consumers want everything from video-on-demand (VOD) to high-speed Internet access to other entertainment amenities, multiple system operators (MSOs) are looking to streamline services onto one bill that spell out a myriad of offerings.

"There used to be just one bill for video services," says **The Strategis Group** analyst Keith Kennebeck.

"Now you need not only to integrate voice services through cable modems, but also in the back office, you need to bill for those services."

Cable companies are trying new ways to deal with billing problems. Atlanta-based **Cox Communications** offers flexible billing where services can be put on one bill, as well as a discount for offerings when residents are away on vacation.

"They (Convergys) have specific solutions for cable providers and have made improvements for technology and management."

—Keith Kennebeck,
The Strategis Group

AP Engines is trying to provision cable modems at the home address, as well as do event collection, said Jon Seig, the company's president. "We're looking towards realistic usage billing which will be based on real events," he says. The company also has the capability to bring the billing systems into traditional telco billing formats.

Portal Software and **Terayon** are following a similar philosophy. In an attempt to free operators from flat-fee pricing, the companies announced an

We have gone to great heights to provide you the accuracy you need.



Introducing the Wavetracker® models LA 795 and LA 2000. They are joining the proven family of Wavetracker products—all field-tested, all rated superior by customers, and built with quality for the long haul. A guaranteed migration path lets you start small and upgrade any time! You can now manage your signal leakage program with unmatched efficiency thanks to Channel Tag® techniques, the added positional accuracy of differential G.P.S., and the unique APLAS software that allows you to print the FCC form 320. No one else provides the total solution like Cable Leakage Technologies!

All New:

- New Low Price
- New Model Line-up
- Real Time D.G.P.S. Most Accurate Ever
- New Map Editor
- New A.P.L.A.S. Software Release

Standard:

- Trilithic Channel Tag Ready
- Windows Based, One-Step Processing
- Work Order Creation
- Quality Control
- Time Management
- Quarterly Monitoring/Comparison



Get on track with
Wavetracker® at
www.wavetracker.com



CLT CABLE LEAKAGE TECHNOLOGIES

1200 Executive Drive, Suite 136
Richardson, Texas 75081
800.783.8878 · 972.907.8100

Aerial Drop Duct

Fiber to the Home.

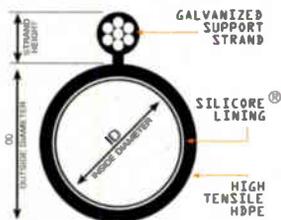
The new solution for increasing bandwidth.



- Lightweight, self-supporting and small enough for pole-to-home use.
- Perfect for fiber optics, copper cable or coax.
- SILICORE[®] super slick lining.
- Easy

one-step installation, even through treed areas.

- Easy upgrades at less expense.
- Ideal for home or small business applications.
- Protects your investment.



dura-line

PROTECTING Your Investment

800-847-7661 www.duraline.com

Agile Demodulators



“Call us for all your agile demodulator needs, including fcc compliance testing!”

800-922-9200

www.megahz.com • engineering@megahz.com

MHz
MEGA HERTZ
Established 1975

STOCKS

VIDEOTEK[™]
A Zero Defects Company

“Unique” Products For the 21st Century!

Oregon, Arizona, Colorado, Texas, Missouri, Ohio, Pennsylvania, Georgia, Florida, New Hampshire

alliance to integrate Terayon's synchronous code division multiple access (S-CDMA) cable-modem system with Infranet, Portal's customer management and billing platform. The solution provides real-time billing and multi-tier pricing support for IP services deployed by cable operators and service providers.

Enhanced Telecommunications is doing convergent billing and associated services, working with cable operators to meet their specific needs, says Pete Pifer, the company's president.

The company has 20 full service providers (FSP) that use its services, and interfaces with HITS and NextLevel, **Scientific-Atlanta's** digital DNCS.

Convergys deals

While no one company has solved the billing problem completely, **Convergys** has received high regard for its efforts to make billing simpler. “They have specific solutions for cable providers and have made improvements for technology and management,” said Kennebeck.

Convergys, which recently announced a five-year agreement with **Verizon Wireless**, is able to stream consolidation, provide switch management and interactive billing technology. **Concurrent Computer** has decided to include Convergys' integrated communications operations management system (ICOMS) in its expanded VOD backoffice order processing system. ICOMS allows cable and broadband service providers to establish one customer record for multiple services and have an improved single view of the customer for better managing customer relationships.

Along with providing simplicity, cable operators recognize they need to provide better customer service. Creating a better billing mechanism helps achieve that goal.

“Support people need to have all the information they need so they can provide customers with necessary information,” says Pifer.

TESTING

*Technology is changing...
so is Viewsonics*

Drop Amplifiers

As part of the new family of Viewsonics drop amplifiers, the VSA-600 series is designed for broadband multimedia systems that require high quality RF amplification and features an industry leading 6KV surge protection on all ports.

FEATURES:

- ✓ 1 GHz bandwidth.
- ✓ 6KV surge protection on ALL ports
- ✓ <3.8dB noise figure
- ✓ Blocking capacitors on ALL RF ports
- ✓ Passive return path
- ✓ 1, 4, or 8 output ports
- ✓ Local or remote DC powering
- ✓ Solder back cover
- ✓ LED power indicator
- ✓ ALL ports sealed to 30psi
- ✓ Double plating (nickel and tin) for superior corrosion protection

Visit us at the Western Show
Booth 961

In-House Test Equipment Includes:

- Spectrum Analyzer - HP 8561B
- Tracking Generator - HP 85640A
- Network Analyzer - HP-8753C
- R.F. Signal Generator - HP 8648C
- Noise Figure Meter - HP 8970B
- Multiple Frequency Signal Generator - Matrix SX-16
- High Voltage/Surge Tester - Keytek EMC Pro
- Environmental Chamber - Sun Sys EC - 10
- Close-Field EMI Probe Set - HP - 11945A
- Salt Spray Chamber
- FFT Network Analyzer - SR770

Testing Performance

Viewsonics inc.
Share the Vision

3103 N. Andrews Avenue Extension
Pompano Beach, FL 33064
USA Toll Free: 1(800) 645-7600
Tel: (954) 971-VIEW (8439)
Fax: (954) 971-4422
Email: viewson@viewsonics.com
Web: www.viewsonics.com



CONNECTING WORLDS

TRANSMITTING IDEAS

Barco Communication Systems has a new name:

BarcoNet

More than just a name change, however. A new name for a new company, and a new vision: a future that embraces the world of broadband and delivers more interactive services. A future we already understand.

Working as your partner, we will help you find reliable multimedia distribution solutions that continue to satisfy the demands of your customers. From this day to the next. From one world to another.

To see the light and find out more, visit www.barconet.com





Understanding reverse path RF problems: Part 2

Last month, I covered several common problems that will adversely affect upstream RF performance: improper plant alignment, ingress and impulse noise, common path distortion and improper headend combining. Together these represent the

“If your system uses interactive set-tops for impulse pay-per-view, the set-tops probably transmit an upstream carrier in the 9 MHz to 11 MHz range.”

majority of upstream problems that’ll keep you awake at night. This month I’ll share some additional problems that are guaranteed to give you as much gray hair as raising teenagers.

Allow me to continue last month’s assumption that your system’s reverse path has already been activated and is operational. Let’s further assume that your forward and reverse have been properly aligned, you have leakage and ingress nicely under control, there’s no common path distortion, and headend combining was done right. What else is there that could possibly go wrong?

And you thought you’d get off easy!

Babbling set-tops

If your system uses interactive set-tops for impulse pay-per-view (IPPV), the set-tops probably trans-

mit an upstream carrier in the 9 MHz to 11 MHz range. As long as everything is working, no problem. Every now and then one of these IPPV set-top’s upstream transmitters may go “ga-ga” and start transmitting at its maximum output level.

Murphy’s Law says the problem will be intermittent, making it tough to track down. This is called a babbling set-top, and it’s not a good thing. Under some circumstances the

carrier may be on all of the time. Either condition is troublesome, because not only will the babbling set-top interfere with other set-tops’ upstream transmissions, but the carrier may be strong enough to clip upstream actives. If the active being clipped is the node’s reverse laser—the most likely scenario—nothing gets through. Not even the most robust modulation scheme. This is because a laser has no optical output during clipping. Incidentally, the same thing will happen if ingress or impulse noise clips the laser.

Another potential problem is harmonics of the set-top’s fundamental upstream frequency. Let’s say your set-tops operate at 10 MHz and your cable modems operate at 20 MHz. The high-level babbling set top carrier may generate harmonics in subscriber or network passives (see

“passive device intermod” a bit later), or perhaps in the network actives. Even if laser clipping doesn’t occur, the harmonic interference may cause throughput problems for some of your cable modem subscribers.

Locating the offending set-top isn’t always a piece of cake. You’ll likely have to do a little detective work. Start by isolating the node where the problem set-top resides. Next, employ a little divide-and-conquer if possible. The worst case troubleshooting technique is to start turning off the set-tops one by one until you find the culprit.

Transient hum modulation

Yeah, I know this is a technical sounding term, but that’s what it’s called. It’s basically the generation of hum modulation in passive devices, usually as a result of ferrite saturation. Time now for a war story.

A couple years ago **Shaw Cablevision’s** Allan Hamilton posted an interesting problem on the SCTE-List (see “Hum Got You Down?” in the May 1999 issue of *Communications Technology*). He described a situation where neutral fault currents that normally exist on the outer surface of drop wiring that’s bonded to the power company neutral were getting into the drop via a splitter. The mechanism was the splitter’s toroidal transformer. The low impedance (at DC and low frequency AC) of the toroidal transformer and its internal connection to the splitter housing allowed the neutral current to travel

INGRESS **WAS UNDETECTABLE IN TRAFFIC...**

UNTIL *TraffiControl*TM

Ingress hides in traffic...

but that doesn't mean it's not there, slowing down your internet services, disrupting return path communications, frustrating your subscribers. You can monitor ingress in empty bandwidths and make guesses about what's happening in occupied bands, but your business is growing fast, and those empty bands aren't going to stay empty for long. When they're full how are you going to keep an eye on ingress?

There's only one answer...TraffiControlTM

The TRILITHIC GuardianTM Return Path Maintenance System is the only return path monitoring system with TraffiControlTM. A DSP breakthrough, TraffiControl removes legitimate return path signals as Guardian scans your system, providing you with a clear view of noise and ingress. The Guardian System alerts you to ingress outbreaks and transmits the ingress spectrum to your Guardian 9580 SSR Field Units. Your technicians will be solving the problem before your subscribers even notice a disruption. Call TRILITHIC for more information. You'll see for yourself - ingress can't hide from TraffiControl.

9202 E. 33rd Street, Indianapolis, IN 46235 USA • 317.895.3600
800.344.2412 • fax 317.895.3613 • <http://www.trilithic.com>



TraffiControlTM Now Available On Trilithic's GuardianTM 9580 Return Path Analyzer

GUARDIANTM **SYSTEM**

Return Path Maintenance Technology



TRILITHIC

INNOVATIVE ENGINEERING

from the splitter housing into the grounded end of the transformer's windings and out through the splitter input port's center conductor.

From there the current traveled to the tap, which was the variety without blocking capacitors at each tap port. There the current passed through the tap's internal toroidal transformer and coupled to the tap housing and drop shield. Down the drop it went, arriving at the splitter housing and completing a circuit!

The result? The drop splitter's toroidal transformer ferrite material saturated because of the current passing through it, generating severe hum modulation. How severe? Try 20 percent. Ouch!

“An interfering harmonic of 33 dB is high enough to create very visible picture interference.”

This little episode caused about 40 percent upstream packet loss for the affected cable modem subscriber. The fix was to replace the drop splitter with one that had blocking capacitors at its ports.

Passive device intermod

Your splitters aren't out of the woods just yet. Under certain conditions, high-level upstream signals passing through a drop splitter can result in the splitter generating beats that interfere with downstream signals in the home (or maybe even other upstream signals), depending on the frequency of the high-level upstream signal. Passive device intermod happens if the splitter's ferrites have residual magnetism present, and the upstream signal is very high—on the order of +50 dBmV to +60 dBmV. This combination can result in the generation of intermodulation products such as the upstream signal's second harmonic.

Let's say your cable modems operate at 28 MHz. The second harmonic of 28 MHz is 56 MHz, which is just a tad above channel 2's visual carrier. Even if the splitter generates a second harmonic that's 80 dB down from the fundamental frequency, that means a +50 dBmV cable modem signal will result in a -30 dBmV harmonic. If channel 2 is, say, +3 dBmV, the interfering harmonic will be down just 33 dB, which is high enough to create very visible picture interference.

The good news is the interference will be intermittent and very brief, occurring only when the cable modem transmits. When it does happen it will look like noise in the

picture. The bad news is the interference will be intermittent and very brief, occurring only

when the cable modem transmits. When it does happen, it will look like noise in the picture. Arrgh!

As you can imagine, finding this problem has the potential to be a real challenge. But when you do, there are a couple remedies. One thing you can do is demagnetize the splitter with one of those bulk tape erasers. I'm not making this up. It will work, at least until the splitter ferrites become magnetized again, say, as a result of a surge or transient. A better fix is to replace the splitter with one that has been designed to combat passive device intermod. This type of splitter usually has blocking capacitors at all ports, along with a tweaked ferrite mix and possible splitter circuit revision.

Group delay

I've harped on this particular gremlin before, but it's still a problem unfamiliar to most folks in the industry. When there is no group delay in a system, network or component, all

frequencies within a defined given will take the same amount of time to traverse that system, network or component. When group delay does exist, some frequencies will arrive at slightly different times than other frequencies. This time difference is measured in nanoseconds (ns). In case you're interested, the data over cable service interface specification (DOCSIS) worst-case upstream group delay spec is 200 ns/MHz.

So, what causes group delay? Most of the time it happens when the frequency response isn't flat. What are the symptoms when group delay occurs? Data bit error rate (BER) performance goes in the tank. How can you prevent it? Make sure your upstream frequency response is nice and flat. As well, keep digitally modulated carriers away from band edges. Diplex filters have a nasty habit of having lots of group delay near band edges.

Oh, yeah. Back to that DOCSIS group delay spec. If you think 200 ns/MHz leaves a reasonable amount of headroom, you're in for a surprise. It doesn't take much in terms of so-so frequency response to reach 200 ns of group delay. I've seen field measurements that corroborate this. Bottom line: keep the frequency response as flat as you can. Hmmm, haven't we heard this somewhere before?

Well, as usual, I've run out of space before I run out of things to say. Tell you what, I'll continue this discussion next month. I've got a few more upstream RF problems that will no doubt keep you on the edge of your seat. In the meantime, if you have some war stories you'd like to share, drop me an e-mail. I'll publish some of the more interesting ones. **CT**

Ron Hranac is senior technical editor for Communication Technology. You can reach him at rhranac@aol.com.

Did this article help you? Let us know your thoughts. Send an e-mail to snayalkar@phillips.com.



Sometimes Less Is More!

Lectro CPR®—Feature Rich

The Lectro CPR is no lightweight when it comes to packing in the features—and it happens to be over twenty pounds lighter



than most broadband UPS's. Our advanced microprocessor-based technology features higher efficiencies, battery management, three levels of status monitoring and better voltage regulation and reliability for today's modern HFC broadband networks.

Look at these features:

Line Interactive Ferro Topology (LIFT™) – a patent pending powering architecture providing vastly improved

operating efficiencies over wider load ranges from no load to full load. One model fits virtually all network locations.

Advanced Battery Management (ABM™) – a built-in monitor/management system that ensures that your system batteries are optimally charged and automatically tested every 21 days.

CPR Communicator™ – an upgradeable multilevel status monitoring solution based on industry standard network management software. Three choices exist—local, RS232 serial output or on-board transponder provide the operational flexibility you need for the best network solution.

Headend Status Monitoring Made Simple – Lectro CPR offers multilevel status monitoring with advanced headend remote capability. Our solutions are designed with open protocols for Level Two RS232 and Level Three embedded transponder.

Safety By Design

Lectro CPR features a fully enclosed and fan cooled chassis for more efficient operation and extended component life. The enclosed chassis means technician safety is assured against electrical and burn hazards.

Lectro CPR offers a much higher operating efficiency and regulates



*Lectro CPR
Long Life Batteries*

output voltage at a tight $\pm 3\%$. Higher efficiencies mean peak operating performance, less component failures and utility cost savings.

LECTRO®





Go Figure!

CPR Costs Less Where it Counts

Based on a per kilowatt-hour cost of \$.10, the Lectro CPR Power

Supply will save the MSO \$46,000 (per 100 units) in

utility power bills over a five year period due to the greatly improved

operating efficiency of the unit. This is based on an average of 1500 watts power consumption per unit with an average network size of 100 power supplies. Now that's significant savings!



| | |
|------------------------|---|
| kW/Unit/Year | (1500 Watts x 24 Hrs x 365 Days).....13,140 kWh |
| Utility Rate | \$.10 per kWh |
| Utility Cost | \$1,314 per Unit per Year |
| Efficiency Improvement | 7% (versus Basic Ferro) |
| 5 Yr Savings | \$460 per Unit per Year |
| 100 Units per Network | \$46,000 Savings Every 5 Years |

convergence of on-demand video, telephony, internet service and CATV come together, Lectro stands ready to answer the challenges with the newest 24 Amp CPR. Call us today and discover how you can change the way you power your network today, tomorrow and into the 21st century!

Future-Proof Your Networks for Telephony Services

Lectro's new 24 Amp CPR Power Supply provides for powering two separate coax legs. The newest CPR family member was designed to accommodate higher telephony penetration without an increase in power supply locations. *It also has the highest current output rating in the broadband industry.* As the



Powering the Heart of

Your Network

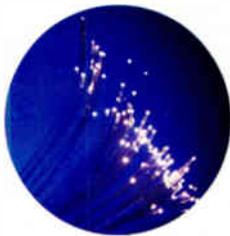
Visit our websites at www.lectro.com or www.invensys-energy.com for more information on the entire family of powering products offered by Invensys Energy Systems.

Invensys Energy Systems – North America
8380 Capital Blvd
Raleigh, NC 27616 USA

Phone: (919) 713-5300
(800) 551-3790 (USA only)
Fax: (919) 713-5350
Email: salesinfo@invensys-energy.com

Earn Career-Boosting Credentials

Enroll in SCTE's
Certification Programs



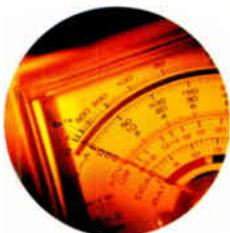
• Broadband Communications
Technician (BCT)



• Broadband Communications
Engineer (BCE)



• Broadband Service Technician (BST)



• Telephony Certification
Program (TCP)

Enroll today at www.scte.org
or call 800-542-5040.



Society of Cable
Telecommunications
Engineers

He thought he'd
seen everything
on cable.

Until you turned it
into a high-speed
Internet rush.



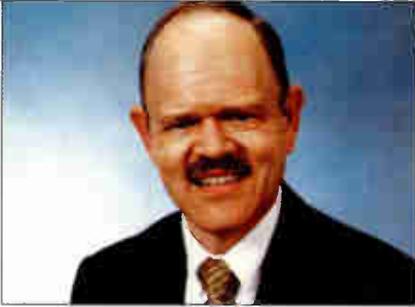
Lucent is deploying new revenue-generating solutions for **high-speed data over cable** today. That means ultra-fast Internet access, video-on-demand, even full-featured telephony, all over one cable network. Our CableConnectSM Solutions are reliable, scalable, highly secure. Equally supportive of mission-critical business applications and mission-critical interactive games. Change the way people look at cable, and you change the way they live, work and play. Lucent CableConnect Solutions. We make the things that make communications work.TM

Expect great things.SM

Lucent Technologies
Bell Labs Innovations



www.lucent.com/cableconnect
1-877-534-9182



The Key to IP Services Implementation

Last month, we looked at support tools for Internet protocol (IP) network interface units (NIUs). These highly visible and often used interfaces to operations support systems (OSS) are a relatively small subset of the support toolkit that must be in place before carrier-grade local IP telephony can become a cable industry service offering. This month's column expands the view beyond the technician interface to the systems integration needed to provide IP-enabled customer services.

To understand systems integration, it helps to have the 1,000-foot perspective of all the support systems needed in providing converged communications services. There are various network management models that do this by categorizing the pieces of an overall systems architecture into layers. Examples are the Telecommunications Management Network (TMN) developed by **Telcordia**, and the PacketCable OS specification. While the models all differ slightly, common terms that form building blocks exist.

At the lowest layer of the typical model, network elements (NEs) are the hardware and software components. This terminology is widely used (or misused) in vendor literature. A headend technician supporting **Arris Cornerstone** telephony, for example, might believe the term applies only to the host digital terminal (HDT), since this is the network element most frequently referenced in Cornerstone system documentation

and system maintenance interfaces. A fiber node, however, is another example of an NE in a traditional cable system. IP telephony brings its own NEs into the picture, with IP NIU as one type, along with cable modems, gateways and cable modem termination systems (CMTSS).

Element managers are at the next layer of the model. These are also hardware and software, but software is typically what differentiates one element manager from another. Hardware is the computer that runs the software and the associated user interface, such as a video display terminal or printer. Software is the management tool that allows the technician to communicate with the NE via the user interface. That communication may include configuring an NE for initial operation, monitoring its operation, or changing its status.

Some network management models include a network manager layer, which is essentially a management system for a set of element managers. A network operations center (NOC) would be at this level.

Above these layers, the focus changes from operations support systems to business processes. TMN has a service management layer that includes provisioning and order entry, for example, and a business process layer that might contain a budget process or a five-year business plan. Many of the systems in these layers are often called "back office," because the customer does not directly interact with them. (The

degree of customer interaction is changing, especially for provisioning. More on that topic later.)

All working service providers have most of the pieces of a model architecture in operation. For example, there are systems that monitor fiber nodes, other systems that dispatch a technician to install video service, and others that create bills. These existing systems are often called "legacy" systems.

The key to a network management model in a converged services environment, however, is that all the layers work together. That's the gap between the model and reality, and what makes introduction of advanced services that integrate data, voice and video so difficult. Cable companies have traditionally built or purchased each piece separately, as they were needed. Consequently, each of the pieces, and in turn, each of the layers, is working independently, even though the same information may be needed by each. This independent operation makes it difficult to create combinations of services at the business process layer that match the technological possibilities enabled by innovations such as IP at the lower layers.

Tying the legacy systems together and marrying them with new systems and processes is the role of a systems integrator. Although a service provider can be its own systems integrator, it often makes sense to leverage the experience of an outside consulting firm that has done the job

While *you* were
into polyester,



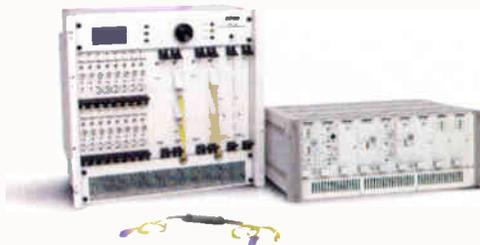
we were into
a different fiber.

For the last two decades, IPITEK has been a premier supplier of state-of-the-art optical networking systems and components. IPITEK's technologies enable network service providers to offer a range of broadband services, including high speed Internet access, multichannel video, telephony and video on demand.

Consistent performance of quality products, backed by a team of knowledgeable engineers, product specialists and customer service personnel, makes IPITEK the *dyno' mite* choice for all of your fiber-optic needs.

- SONET / SDH Transport
- DWDM
- Fiber Management
- Passive Optical Components
- HFC Access

For more information, call 888 4-IPITEK (447-4835)



IPITEK
INTEGRATED PHOTONIC TECHNOLOGY

www.ipitek.com 760-438-1010
sales@ipitek.com

several times before for other companies. Major consulting firms that have traditionally provided systems integration for companies in data processing applications are therefore beginning to offer a similar service to cable operators.

Communications equipment vendors that have needed to solve the challenges of integrating their own products with legacy systems are also bidding for overall system integrator roles, with or without their hardware component. ANTEC, Lucent, and Nortel are beginning to be recognized as sources of such expertise. Telcordia, which used to be the Bell Operating Co. research and development arm, is also in that business. Typically, the systems integration they perform is done by a "professional service" department.

The systems integrators often part-

ner with software firms specializing in creating interfaces between legacy systems and their own applications. The number of these software interface vendors is also growing. **CommTech** (Cranbury, N.J., www.comm.com) is one that I mentioned in my column last January. **Ceon** (Redwood City, Calif., www.ceon.com) is another, as is **AP Engines** (Maynard, Mass., www.apengines.com).

There are various names for the products delivered by the interface vendors. The ones I believe are most descriptive are "adapter" and "mediator." Adapter seems to imply an evolving environment, that takes the best of the existing tools, and modifies them to work in a new system. Mediator describes the function that needs to occur for systems with different protocols, databases and internal logic to work together.

Irrespective of what you call them, these interface products provide the translation needed for one system to talk to another. This function is necessary because data is stored in different formats, and different protocols have evolved for communications between parts of each system. Translation may be necessary even when two systems are performing similar functions. For example, one element manager may use SNMP to communicate, while another may be based on TLI. Both need data, such as customer names and addresses, that is stored in yet another system.

Adapters also provide an interface between legacy systems and new applications. For example, both Ceon and CommTech offer an application that builds a Web-based e-commerce portal with linkages to order entry. Since order entry also may be linked to equipment provisioning, this portal may be used by an operator's customers for service upgrades. Of course, an adapter link to the billing system ensures corresponding new revenue flow from the upgrade.

What this means to cable technicians is that life is becoming both easier and more difficult. The easy part is that systems integration often provides a set of new tools that aid troubleshooting by delivering more complete information about a customer's service subscription, including historical trends. The hard part comes with specialization—for example, RF tech, data tech or telephony tech—is no longer adequate. The linkages between the layers of the network model and its components have made it necessary to understand how all the systems fit together. **CT**

Justin J. Junkus is president of KnowledgeLink, and applications engineering director for ANTEC. You may contact him at jjunkus@knowledgelinkinc.com.

Did this article help you? Let us know your thoughts. Send an e-mail to snayalkar@phillips.com.

Wideband Interference Filters for C-Band TVRO



7892D

- Compatible with digital LNB's
- < 0.5 dB typical insertion loss
- < 8 ns typical group delay
- < 6" long
- Available for all international bands.

"Call us for all your filtering needs"

800-922-9200

www.megahz.com • engineering@megahz.com

MHz
MEGA HERTZ
Established 1975

STOCKS

MF

MICROWAVE FILTER COMPANY, INC.

"Unique" Products For the 21st Century!

Oregon, Arizona, Colorado, Texas, Missouri, Ohio, Pennsylvania, Georgia, Florida, New Hampshire

Look what Riser-Bond Instruments has developed for the new millennium!

— INTRODUCING —

The new and improved
Model 1205CXA
TDR Cable Fault Locator...
the next generation
in a great family of TDRs.

Larger and brighter Liquid Crystal Display for a greatly enhanced viewing area.

Simplified keypad layout and pop-up function menu for more user-friendly operation.

Sub-nanosecond pulse finds small faults that plague high bandwidth systems or cause digital signal interruption.

Simplified waveform storage function for easier cable plant documentation and archiving.

Rugged outside plant packaging.

The Model 1205CXA is the most sophisticated yet easy-to-use TDR available today!

**Riser-Bond Instruments
is focused on the future!**

Riser Bond
INSTRUMENTS



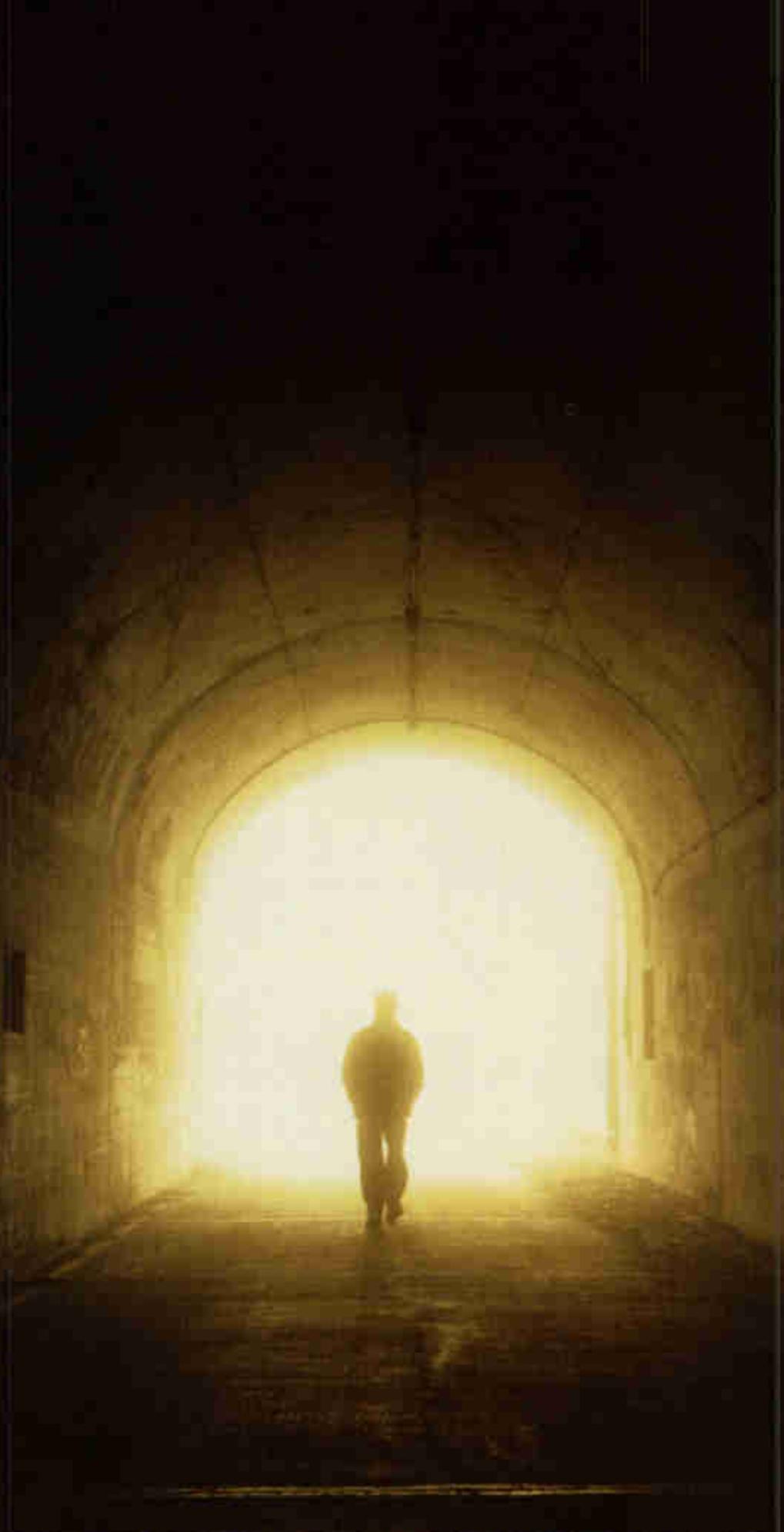
A United Dominion Company

Toll Free U.S.: (800) 688-8377
Telephone: (402) 466-0933
Website: www.riserbond.com
E-mail: info@riserbond.com

MODEL 1205C

MODEL 1205CX

MODEL 1205CXA



Upgrades Are Nearly Complete:

Enter the Golden Age of Television

By Natalia A. Feduschak

As 2000 draws to an end, cable operators have been drafting their to-do lists for next year. With most major operators having already implemented upgrades, next on their list of priorities is launching services that will help widen their customer base and effectively compete against telephone companies, which are beginning to offer video services that encroach on cable's turf.

To give you a blueprint for what's hot in the coming year, *Communications Technology* editors have compiled a series of articles for our October and November issues on the most pertinent planning issues for 2001.

VOD comes of age

"Broadband and television are going to see golden times in the year to come because of changes in distribution technology, distribution in interactive technologies and the demand for them," Alex Best, vice president of engineering for Atlanta-based **Cox Communications, Inc.**, says. "We're just at the beginning, I believe."

Video-on-demand (VOD), interactivity and the cable modems that make new services possible are expected to top the list of priorities for the cable industry in 2001.

Cable revenues, including new services such as cable telephony, cable modems and Internet services, are projected to grow from \$35 billion in 2000 to over \$48.6 billion in 2004, according to the **Strategis Group**, a Washington, D.C.-based research firm. Despite these figures, the industry is expected to add only 1.1 million basic cable subscribers by 2004.

"We need to grow since plain, old cable is 65 percent penetrated," Best

says. "The growth mechanism will come from new products."

The greatest revenue increase is expected from video, which analysts say will remain cable's core business. Strategis forecasts video revenues, which includes digital video, will increase from \$33.2 billion in 1999 to \$43.2 billion in 2004.

The industry's experience with VOD proves that the service is both technologically and economically feasible, Best says. Cable operators will launch aggressively hundreds of channels with VOD offerings, giving consumers many choices.

Operators have faced major pressure to go digital, says Robin Wilson, director of business development for **Harmonic Inc.**, a Sunnyvale, Calif.-based broadband service provider.

Technology has also increased operators' ability to take signals from satellites and make them fit into cable channels.

"That technology will start to see a much more rapid deployment," says Wilson.

Paul Gemme, vice president for plant engineering at **Time Warner Cable**, says his company will continue to roll out digital boxes, enabling the company to launch a host of services including VOD. >

One of the problems in deploying VOD has been getting sufficient customer premise equipment (CPE) into the field because of manufacturing shortages, says Gemme.

"To grow, this business needs CPE devices in the field," he says. "This year we ran into glitches due to component shortages." This scarcity has slowed down Time Warner's ability to get into the home, and manufacturers now see they have a problem. Gemme says he expects these snags will be taken care of in the coming year.

"Demand has jumped far ahead of what manufactures of components thought it would be," he says.

With VOD taking off, Time Warner is also concerned about the industry's ability to provide high definition television. Also, the company will be affected by its pending merger with **America Online**.

"We know [AOL is] going to want us to launch some of their services. To us, that's a piece of doing business... We do want to have a bunch of services that fit their lifestyle," Gemme says.

Interactive TV still on the horizon

Cox's Best says the move to VOD has set the stage for interactive television, although operators are approaching the technology with caution.

Keith Kennebeck, an analyst at The Strategis Group who tracks the cable industry, agrees and says the next challenge is interactive TV. "It really is too much in its infancy for a top multiple system operator (MSO) to be convinced they want to deploy it wide-scale. No one knows what interactive TV is."

AT&T Broadband's Tony Werner recently said his company would delay deploying interactive television because of technical problems. **Microsoft Corp.** has been late in providing AT&T with interactive-television software, prompting the company to consider other vendors for part of its plans to deploy some 10 million set-top boxes.

While Harmonic's Wilson agrees interactive television is still nascent, he maintains it will become an important offering.

Satellite embraced interactive television before the cable industry did, Wilson says. "But it's finally going to get itself launched in the United States."

More standards for cable modems

Speeding the movement toward VOD, interactive television and cable telephony, will be advances in cable modems. To that end, middleware for the set-top box will be the major milestone for the cable modem industry next year, says Dick Green, chairman of **CableLabs**, the body which establishes cable modem specifications.

The middleware is important because it provides a platform for applications developers to write their software, says Green. The protocol identifier (PID) was completed in July 2000, he adds.

In addition, CableLabs will start its certification wave of the long-awaited Data Over Cable Service Interface Specifications (DOCSIS) 1.1 modem. The modem will be able to carry voice, video and data, and allow for the wide-spread deployment of cable telephony. PacketCable, the standards for IP telephony, are also expected to move forward.

"Each step we take in that realm just brings the packet network closer to reality," says Green. "A combination of those two will greatly enhance the technological platform for IP telephony."

This year could also see the international standardization of the industry, he says. The **International Telecommunications Union (ITU)**, the most important telecom standards-setting body in the world, will discuss adopting CableLabs' telephony specifications in November.

"We hope we will be able to pass it in November," says Green. "That will solve a lot of the problems that people are concerned about with interactive television."

Cable telephony still important

Cable operators know in order to remain competitive, they will have to enter the telephony market. Annual cable telephony revenues could reach

\$2.7 billion by 2005, up from \$133 million in 2000, according to The Strategis Group. Both circuit-switched and IP-based telephony revenues will increase in the next five years, the group predicts. Circuit-switched telephony revenues will grow to \$1.9 billion in 2005 from \$133 million in 2000, while IP telephony will increase to \$717 million from \$2 million between 2001 and 2005.

Cox is already deploying circuit-switched telephony in several U.S. regions and expects to expand the technology with continuing upgrades to provide high-speed Internet access and telephone services.

"We're launching to as many homes as possible," says Best. "What we did last year, we'll do this year."

Time Warner doesn't expect to spend a lot of energy on telephony, but has opted to conduct several IP telephony trials.

"Depending on the success of those and DOCSIS 1.1, we will deploy IP phone service next year," Gemme says. He warns, however, the speed of deployment will depend on how fast the DOCSIS 1.1 cable modem comes to market.

"We don't want to (deploy) without some quality of service assurances," he says. >

BOTTOMLINE

> Video Bound

Upgrades topped the industry's list of concerns for the year 2000. With many of those complete, insiders expect next year to be the golden era of television, with video-on-demand, and associated technologies, such as broadband, distribution and interactive services coming into widespread demand. Satellite will continue its comeback, as the industry becomes increasingly internationalized. Still, the industry will have to do a better job in addressing customer service needs. Smaller MSOs will have to be more aggressive in completing their upgrades.

UNLEASH C-COR.NET

Planning, building and maintaining a broadband HFC network is no walk in the park. Unleash C-COR.net to meet your needs throughout the full life cycle of your network.

In today's fast-paced world, you can't afford to be collared by an outdated network. Our years of experience in providing high-quality Telecommunications Products and reliable Broadband Management Services will help you rest easy, knowing that your sophisticated communications network is running efficiently and effectively.

Give us a whistle at 1-800-233-2267 or www.c-cor.net for more details on:

- Fiber Optic Headends, Hubs and Nodes
- RF Amplifiers
- Technical Field Services
- Integrated Network Management Systems
- Network Enabling Services

Unleash a powerful partner,

Unleash C-COR.net.



AT THE CORE OF CONFIDENCE | for over 329 years (...dog years, that is!)



Looking to the skies

As they move toward offering more services, cable operators are keeping an eye out on direct broadcast satellite (DBS), which is undergoing a resurgence.

"Television is now offering broadband," says Mahmoud Wahba, president of **AlphaStar International**, a satellite television broadcasting company. "On the horizon we see that

television can be transmitted in cable coax...and satellite direct to the home," he says. With compression equipment, signals can be sent to the home using phone lines.

Some 10 projects are currently underway using two-way satellite delivery of broadband. Most are dependent on the low Ka band, and are slated to begin after 2001, says Wahba.

The benefit of satellite is that it al-

lows consumers to access data, voice and video on the go, and covers as wide or narrow an area as the service provider wants.

"There's new technology in wireless that doesn't require line of sight," says Wahba.

However, he believes while satellite is technically a competitor, it can complement cable by providing services to geographic areas that cable cannot reach through use of a two-way satellite to a dish on top of a wireless tower.

Outstanding issues

Despite this year's achievements, operators will have to deal with unresolved issues, like customer service, which many say needs improvement.

"You see all the DBS ads by the dishes saying how bad cable is," says Kennebeck. "People realize cable has that bad legacy as a bad service provider. They need to become very agile, very responsive... They are not just a cable company anymore, they are a full-service provider."

And many smaller MSOs will have to do a more aggressive job with their upgrades.

"With digital, they have to upgrade the system," says Kennebeck. "It's costly, it's time consuming."

Although cable modems are being sold in retail stores, manufacturers will have to do a better job in getting them installed.

"The demands are tremendous," he says.

New challenges

Each year brings new challenges to the industry. Our planning articles that follow this month and next will give you a blueprint for staying ahead in what has quickly become a revolutionary marketplace. **CT**

Natalia A. Feduschak is senior editor of Communications Technology. She can be reached at nfeduschak@phillips.com.

Did this article help you? Let us know your thoughts. Send an e-mail to snayalkar@phillips.com.

One Good Turn Deserves Another.



No other lock locks like a Sterling. Just remove the key and rotate the shackle. Click. That's it. One key fits all your keyed alike locks. (We also make a keyless, disposable lock—the Sterling One-Shot™) The Sterling design is a simple solution to all your medium security problems. And simpler is not only better, it's also more affordable.

That's one more reason so many cable, utility, trucking and cargo companies trust their security to Sterling locks. Maybe you should trust Sterling, too. We guarantee everything from the lock to the customer service so there's nothing you need to worry about. The one-turn, one-key, one-of-a-kind Sterling lock. It's the lock you should choose.

STERLING

SECURITY SYSTEMS
A Division Of Engineering Unlimited

1320 12th Avenue North, Minneapolis, MN 55411 (800) 515-4040 www.sterlingpadlocks.com

VOD WITHOUT THE VOODOO

Real solutions. Real customers. No hocus pocus.

Over the last three years DIVA has helped 6 of the top 9 MSOs offer true video-on-demand to real paying customers. Magic? No. Just hundreds of dedicated engineers and operations experts developing and deploying systems that work. So call DIVA today and let us take the mystery out of VOD. You won't get smoke and mirrors, just real solutions.



D I V A

The Leader in VOD Solutions

www.divatv.com
(650) 779-3000

Designing Tomorrow's Headends



Planning for the road ahead

By Sara Manderfield and Ross Ruschmeyer

Keeping up with today's demand for two-way, interactive services is a daunting task for any cable operator. So how do you also ensure your system is equipped to keep up with tomorrow's new technology challenges? ADC offers its strategies in the first of a two-part series.

Just a few years ago, no one knew about running modems over broadband for Internet surfing. Today, in addition to cable modems, there is an incredible push for digital video, telephony and countless other interactive services. Subscribers have become more discriminating, with higher expectations for reliability, accessibility and response time.

Planning for tomorrow will be more complex

Within the turbulent networking environment, planning for the future has become increasingly more difficult. Most operators are already pushing the envelope in terms of capacity and services in keeping their networks up to date, much less being able to predict what's going to develop.

In the past, making changes was easy when the only service delivered was video. Little consideration was given to how subsequent changes would affect delivery of new services. When adding channels, operators had the luxury of preparing the headend for the changes, implementing them during periods of low viewership. Customers typically didn't notice the interruption.

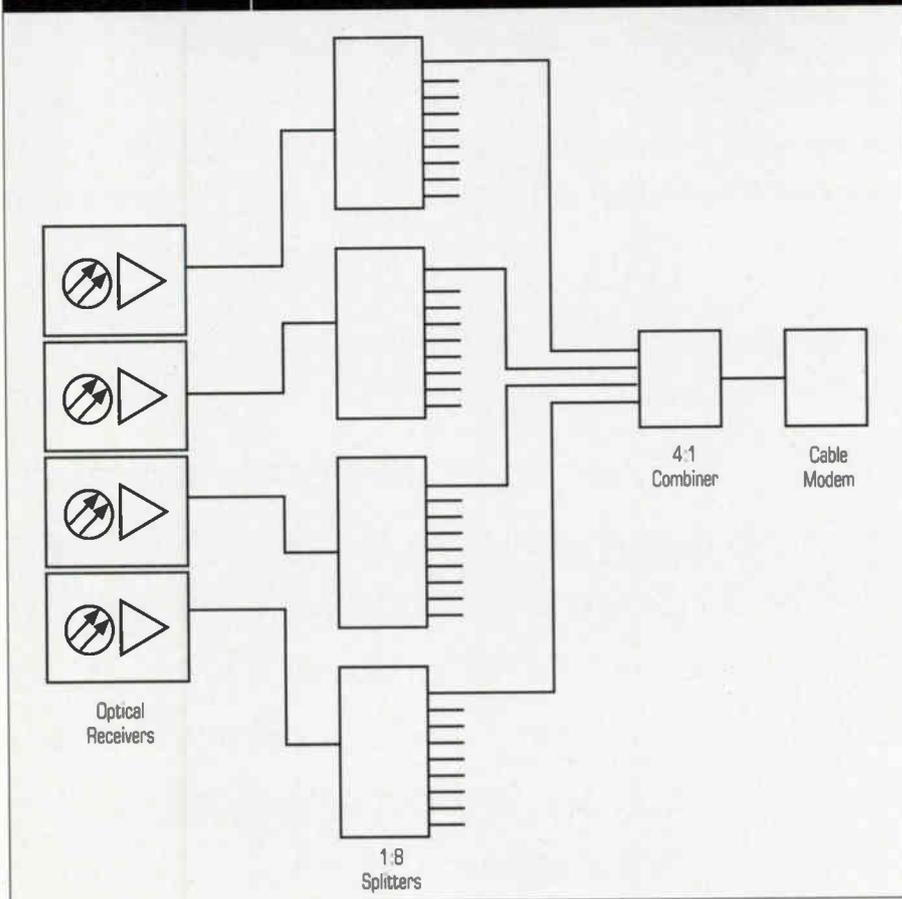
Capacity was easy to figure out, too. Delivering video signals was almost "one-size-fits-all." A video signal was generated, split and distributed to where it needed to go. Operators didn't have to worry about how many customers were served because it was just a matter of reamplifying signals.

Competition is the driver

Today, the window of delivering services is rapidly shrinking while the complexity is magnified. The primary driver is competition. Cable operators are no longer the only game in town, with phone companies now delivering DSL. Overbuilders are claiming they can do things better. To compete, cable operators are being deluged with new initiatives, but are also expected to implement them smoothly and quickly.

A common headend upgrade scenario today has operators adding telephony or data services to their existing video network. Unlike video equipment, cable-modem and telephony equipment typically have some capacity limitations, and quality of service (QoS) associated with a specific number of customers. If you exceed that QoS limit, signals will begin to de-

FIGURE 1 MODULAR RF SIGNAL MANAGEMENT DESIGN



grade or not work at all. This is, of course, unacceptable to customers.

Design for today... or tomorrow?

As they design their headends, operators face a "Catch-22" situation. They can either design equipment for what is initially most cost-effective, or for when the network has grown and services are fully deployed. Though designing a network for initial take-rates is more cost-effective, operators eventually will have to add on as services ramp up. On the other hand, if they design it for a higher-take rate scenario, they invest in a lot of equipment under the assumption that services are going to be successful. It may be difficult to predict take rates, and an operator doesn't want to deploy a full-blown system with only a few customers. Right now, most operators feel confident cable modems are going to be very successful, but they are still adopting a "wait-and-see" attitude when it comes to equipment purchases for the long term.

Modular components a must

Implications for the headend mean the passive and active components deployed must be modular and flexible. These components must perform adequately today and be useful for future requirements.

Historically, the splitter/combiner function used discrete, non-specialized components inserted in the back of an equipment cabinet or haphazardly mounted on the wall. Although functional, this approach was very inflexible, connections were difficult to access, and it took up a lot of real estate in the headend. Functions such as padding or monitoring were not built in to those products. To perform those functions, operators had to use inline pads or devise a customized way to monitor the signal.

Vendors today have an eye on the future and are offering more functionality in modular, compact packages that plug and play into a flexible chassis. With space at a premium in most headends, the high-density nature of these components preserves valuable real es-

tate. Plug-in modules allow operators to configure networks with different functional module types in the same chassis, or add additional splitters/combiners, as dictated by network expansion. For example, an operator can buy an empty chassis and initially add just a few modules. An empty chassis that holds 14 cards is a lot less expensive than buying 14 cards worth of equipment. And there is room to accommodate network expansion without having to worry about reconfiguring an entire rack of equipment. A service addition or service area expansion becomes a simple matter of inserting a new module into an existing chassis.

Support costs

With reliability issues paramount, network planners should not make financial decisions simply by comparing product prices. Component cost is often insignificant compared to the less predictable costs of support and customer impact. Support costs are important for two reasons. First, support is a continuing process. A component is bought once, but must be maintained for life. Second, support costs are not fixed. The tightening labor market continues to drive up the cost of support as it becomes harder and harder to retain skilled labor. The rate of increase in technical labor costs far exceeds today's moderate rate of inflation, so it makes sense to pay a little more for reliable, technologically superior products that help reduce support costs and the potential damage network problems can cause customer relationships.

Managing many signals

Another big consideration for operators is the amount of return path bandwidth from an optical node serving area. The return path is a very narrow piece (5 Mhz to 40 Mhz) of the overall RF spectrum. Because of that, as these usages go up, the spectrum quickly becomes congested. Operators are shrinking node sizes so they have fewer customers using the same amount of return bandwidth. Although this effectively delivers more bandwidth per customer, it also increases the number of serving areas

Scientific Atlanta

Head-End, Line Gear and Passives

NEW

Modulators

6340

Ch. 2-78 A-1 thru A-5

Over 400 In Stock!



**Scientific
Atlanta**

(Integrated Rec. Descrambler)

SA 9660 IRD

NEW

Hundreds

in stock!

Modulators

6350

Ch. 2-78 A-1 thru A-5

Sub-band T-Channels

ALL Options Available



ADDvantage
Technologies Group Inc.
Stock Symbol **ADDM**

SAP

Stereo

Demods

Processors

Receivers

Modulators

GainMaker Amps & Line Extenders

Original SA EQs, Pads & AGCs

450/550/750 mhz Line Gear

TULSAT

800-331-5997 - 1605 E. Iola
Broken Arrow, Ok 74012
www.tulsat.com

LEE ENTERPRISE

800-551-0096 - 701 3rd St.
Deshler, NE 68340
www.leecatv.com

> **The Future of Tomorrow's Headends**

Nobody really knows where today's networks are heading.

They are, however, certain to be vastly different from the networks of old, thanks to the ongoing rush by broadband operators and a slew of new competitors to launch the latest and greatest in interactive services. Digital video, cable modems and telephony are givens—but how do you prepare for a service that isn't even on the drawing board yet? And how do you monitor and maintain it?

What is known is that flexibility will be the key to quick, man-

ageable reconfiguration when subscriber take-rates fluctuate or service offerings expand. For that reason, headend design must focus on modular platforms that allow flexible network configuration.

Network planners would be well advised to pay attention to the "basics" of passive signal management equipment, which can save them time and money as they reconfigure their headends to meet often uncertain demand.

Without building flexibility into the design, today's headends could turn into tomorrow's expensive nightmare.

sending signals back to the headend.

Operators now must also consider how to manage all the signals coming back from the field. With added equipment, today's "mega-headends" have

more cables running through them, which will only increase and become more complicated with the passage of time and the addition of new services. But how are signals going to be redis-

tributed to this equipment? If they are all bundled together, finding a particular cable or tracing a particular signal may be difficult and time consuming. Haphazardly running cables through the headend could result in unintended service outages. Therefore, it is essential to have a cable management system in place that is well organized, easy to understand and able to protect the cables from damage.

Troubleshooting and testing

Troubleshooting too has become—and will continue to become—much more complex, placing new demands on signal management equipment. Most systems employ a chief headend technician who knows everything about how the headend was built and how it operates. In the headend of the future with more services and divisions, this function has become much more segmented and specialized. Big operators may have separate organizations for video, dig-

Engineered Solutions ... for the last mile.

**From New York to São Paulo
a high density 860 MHz
amplifier solution**

The LGB-127 is a 2-way Directional coupler with gain

- 27dB forward gain
- 14dB reverse gain
- Noise figure 6.9dB
- Low power consumption .22 Arms
- 30-90 VAC



LGB



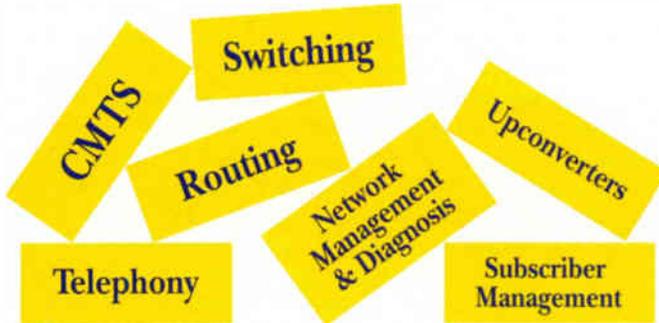
**LINDSAY
ELECTRONICS**

ISO 9001:1994 CERTIFIED

For technical information e-mail us at:
techinfo@hq.lindsayelec.com

You Have A Choice For The First Time —

Typical Solution

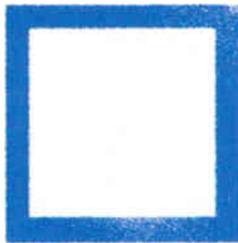


Multiple Systems, Multiple Vendors, Different Management Systems, Large Footprint, High Power and High Operating Cost

Our Solution The Cuda 12000™



Integrated Solution, Increased Reliability, Simplified Management, Smaller Footprint, Lower Power and Lower Operating Cost



CableLabs®
Qualified
*Product
now shipping
in volume!*



And It Couldn't Be Easier. With The Industry's First, Highly Integrated, Next-Generation Carrier-Class CMTS Solution.

The Cuda 12000 is the smart choice for more and more cable operators.

And, it should come as no surprise. The Cuda 12000 was built from the ground up for cable, so you get an uncomplicated solution with the highest level of integration, scalability, quality of service support, manageability and cost of ownership.

Now, thanks to the Cuda 12000, you can choose to fuel subscriber growth, accelerate new innovative service roll-outs and reduce operating costs. Or you can opt for a make-up test. Your choice.

Find out more, call or visit our web site.



877.BASYSTEMS (877-227-9783) www.basystems.com

©2000 Broadband Access Systems, Inc. All rights reserved. Broadband Access Systems, the associated logo, and Cuda 12000 are trademarks of Broadband Access Systems, Inc.

ital video, telephony and data. Each of these groups is responsible for its own services, but uses the common broadband pipe to deliver them.

From an organizational perspective, it has become imperative to understand where each of the signals are and to have specific test points for each. If you had a video problem in the past, you

would just disconnect the feed and check it out. Now if a video technician does that, depending on the location on the network, he may take down the cable modem and telephony service, again causing customer dissatisfaction. With such an increase in new service applications and the dynamic nature of take rates for all services, the need to

quickly and effectively balance signal levels becomes even more imperative.

To address this, many signal management modules have built-in test points, and non-intrusive testing to scrutinize signals passing through the module. This testing can be done without taking down any of the services, and allows technicians to monitor bit error rate information and other valuable data.

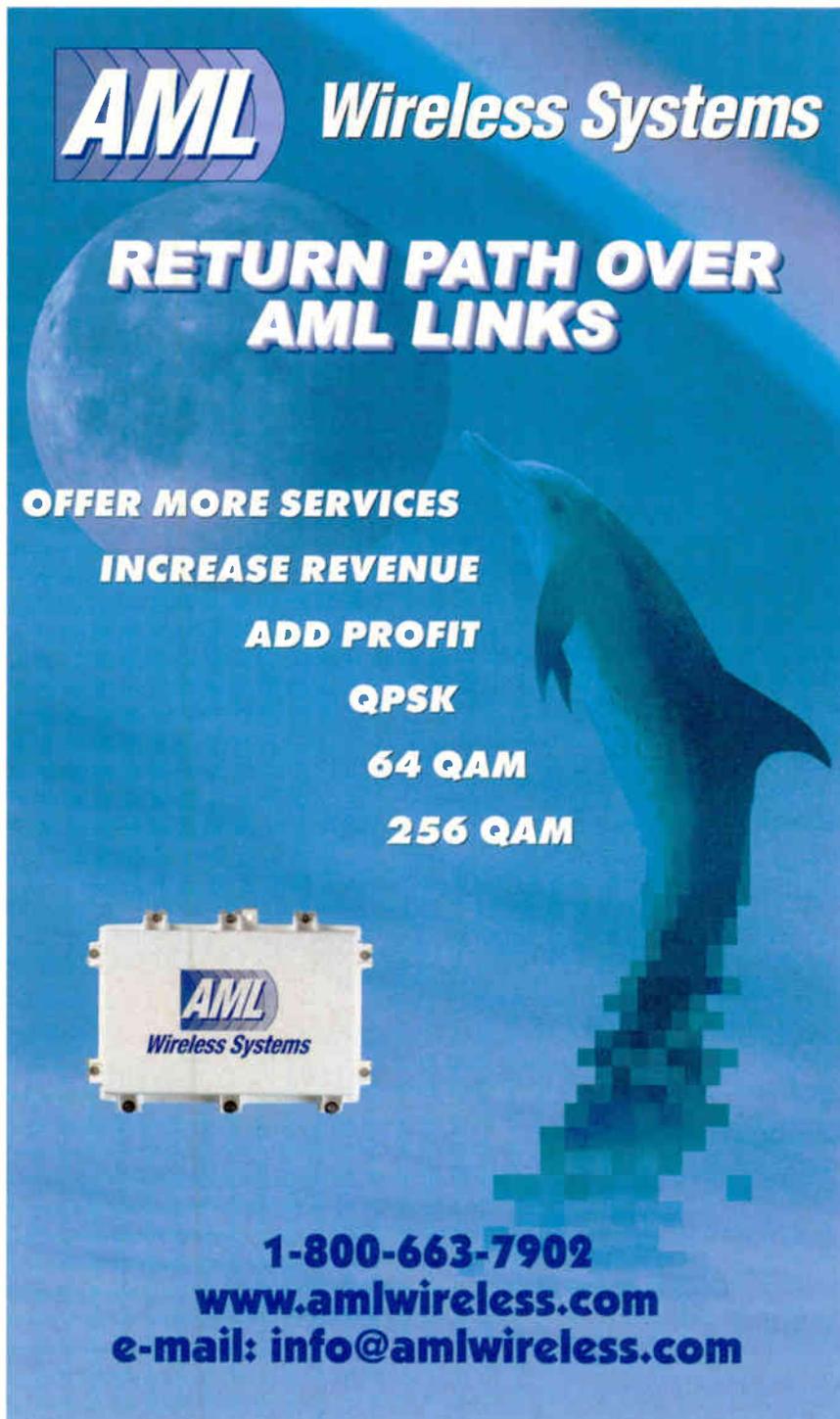
Return paths

Return paths also place an additional requirement for test points. Traditionally, the return paths were not used for much other than low data rates and narrow bandwidth services, such as status monitoring or set-top control. The return path generally didn't touch the customer. In today's and tomorrow's networking environment, thousands of subscribers are using cable modems that do not function without using the return path. Because of the limited bandwidth and frequency spectrum it occupies, return path ingress becomes a huge issue. When services are combined together and take rates grow, unacceptable ingress could affect a number of serving areas making it critical to be able to go into the headend or hub and monitor that signal, looking for noisy nodes and noisy serving areas.

No one knows for sure where today's networks are heading. What is known is that modular platforms that allow flexible network reconfiguration will be essential in supporting the expanded services and growth, along with different testing and troubleshooting functions unique to interactive, two-way networks. Without building flexibility into the design, today's new headends could turn into tomorrow's expensive nightmare. **CT**

Sara Manderfield is the RF signal management product manager for ADC. She can be reached at smanderfield@adc.com. Ross Ruschmeyer is ADC's senior project systems engineer. He can be reached at rruschmeyer@adc.com.

Did this article help you? Let us know your thoughts. Send an e-mail to snayalkar@phillips.com.



AML Wireless Systems

RETURN PATH OVER AML LINKS

OFFER MORE SERVICES
INCREASE REVENUE
ADD PROFIT

QPSK
64 QAM
256 QAM



1-800-663-7902
www.amlwireless.com
e-mail: info@amlwireless.com

Minutes
to install.
Decades of use.



The pre-wired Mini-TIC, only from FONS.



The Mini-TIC is available with ribbon, 900um or stub cable terminations to meet any application.

■ Nothing beats the pre-wired Mini-TIC for speed and reliability when it comes to small fiber count installations. FONS factory terminates up to 12 fibers with any connector style you choose. You simply splice to your trunk cable in the field, insert the appropriate FONS cable assemblies and your network is up and running. The Mini-TIC's unique accordion design offers extra system reliability by clearly separating the splice point from the patch side of the Mini-TIC. Backed with the FONS extended warranty and ISO registered quality program, the Mini-TIC is designed to meet your needs for years to come.

For information on the Mini-TIC and FONS complete line of fiber optic interconnect products, call us or visit our web site.

Call us, it's easy!



Fiber Management Made Easy

FONS, 71 Lyman Street, Northboro, Massachusetts 01532

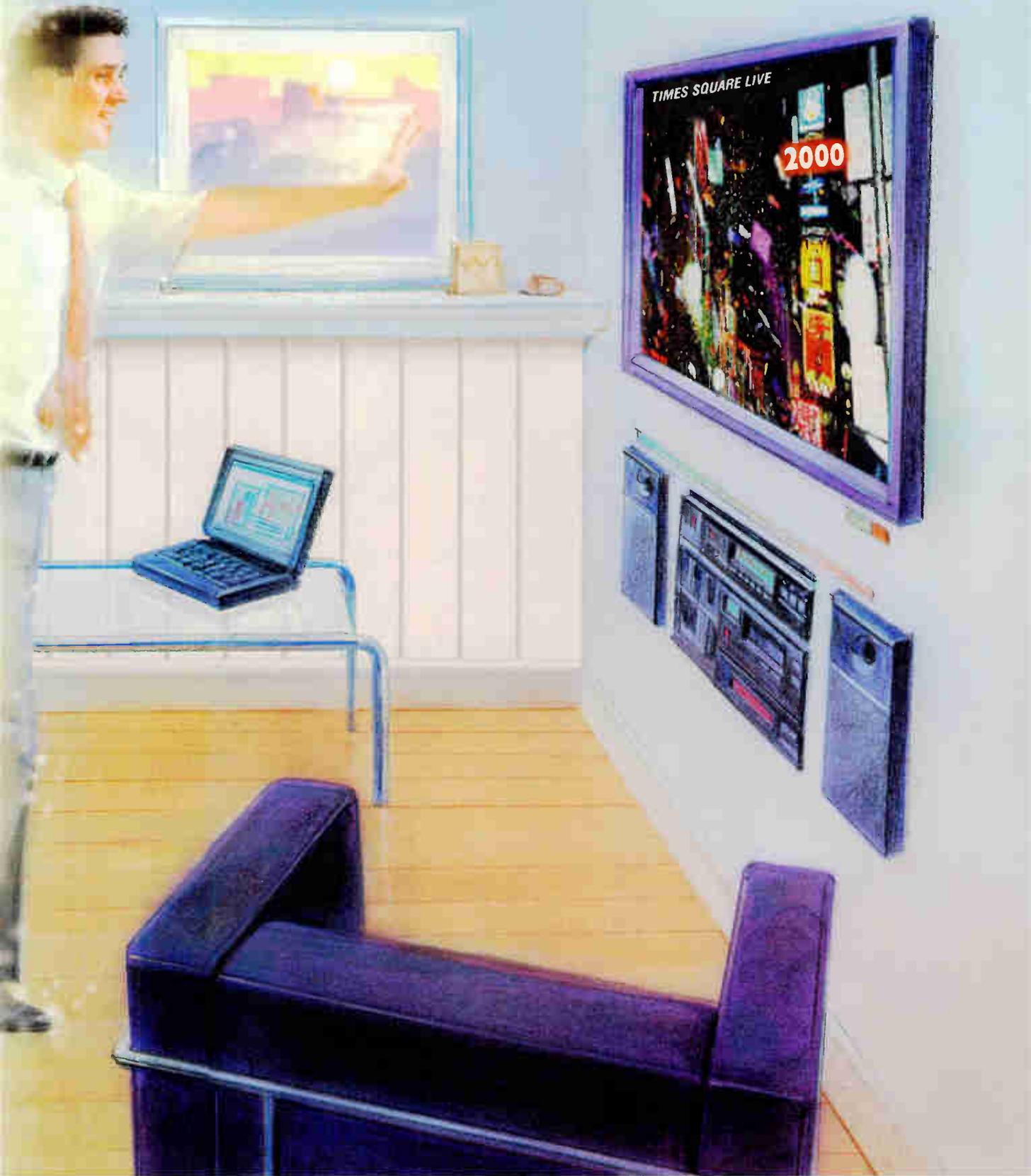
1-800-FONS-995 • www.fons.com

Crossing the Digital Frontier...



Resources are the only barrier between an analog existence and a digital reality.
Broadband Services is breaking through that barrier and accelerating the transition from analog to digital.

at Warp Speed.



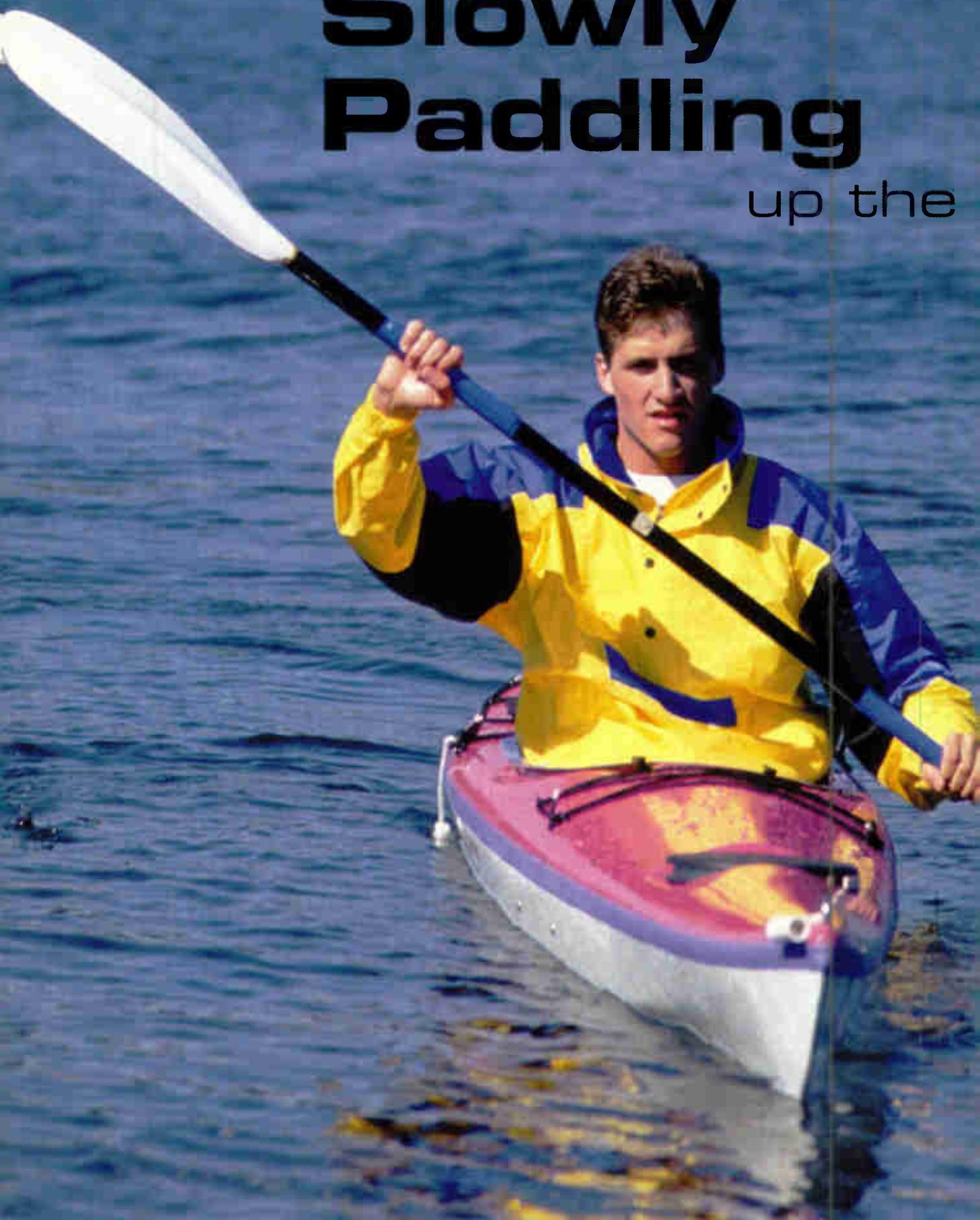
| 866.637.4171



Broadband
SERVICES, INC.

Slowly Paddling

up the





Media Stream

By Arthur Cole

There's no need to deploy a media-streaming solution right away, but it's time to start thinking about one. Here are a few things that will make the planning process easier.

Media streaming. Can't live with it, can't live without it. Well, that's not entirely true. It's closer to: fairly easy to live with it, but perhaps not quite yet.

The technology certainly holds enormous potential. It is, in fact, one of the few applications that really takes advantage of all cable's high-speed data networks have to offer, and will be an improvement over today's copper-based solutions. Imagine your cable-modem customers' amazement when they view the smooth-running video and unbroken audio of a broadband-streaming solution. It will make today's one-frame-per-every-five-seconds feeds seem as archaic as a Victrola.

But there are some problems. First, there is very little content designed for the broadband market, although this will change when the universe of broadband subscribers increases dramatically. Second, there is the Internet at large, which is not wired to handle

bandwidth-intensive applications such as streaming media. You can deliver data to your customers at maybe 300 kbps, but you'll only be getting it into your edge network at 1.5k to 5k using the regular Internet backbone. Even if you can cache an entire clip, it means your customer will have to wait several minutes before it can be delivered in all its broadband glory, which defeats the purpose of a high-speed data network.

Fortunately, there are ways around these problems and the cable industry is in the best position to implement an effective streaming-media strategy.

The first thing cable operators and the engineering community must understand is that, right now, fancy applications, such as media streaming, are not crucial.

"Because we are in the early-adopter phase of broadband, there are only two things driving this service:

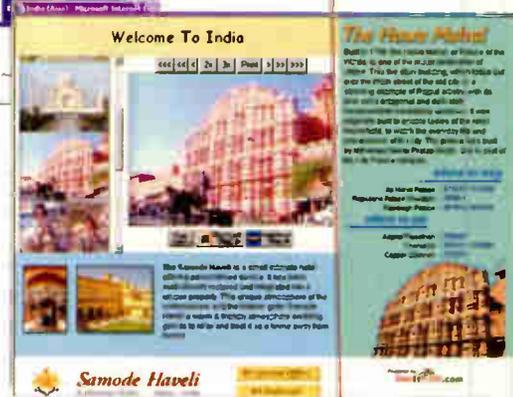
speed and the always-on connection," says Sherman Griffen, product manager for broadband systems at **RealNetworks**, a media-streaming company. "Eventually, that will shift away from these basic needs to value-added services. Companies will differentiate themselves with offerings such as streaming media."

So, for the moment there's no rush to deploy, but it is time to plan. For cable to effectively carry out a broadband media-streaming service, some crucial components must be in place.

- The first is that video quality provided by your network will have to be good enough, not only for subscribers but for content providers. That means you will have to ensure a minimum amount of bandwidth



SeeltFirst.com's Interactive Streaming Platform uses the smart-publishing online tool, GLIDENow, to synchronize related information and e-commerce opportunities, including enhancing the travel video at left, and the event video below.



for each video feed. How much is enough? RealNetworks' RealVideo 8 encoder offers up to 500 kbps, although that may be a little too broad for some operators, particularly for live events that draw numerous requests.

"If you have multiple thousands of users at the same time, you'll need to consider the average bandwidth that they will connect at," says Narayanan Ram, CEO of **SeeltFirst**, which provides interactive capabilities to streamed video. "The average cable-modem bandwidth is about 100k, and you can get a phenomenal media experience at 300k."

- The second component is an effective strategy to deliver video and audio streams to your edge network. As we noted above, the regular Internet is not able to consistently deliver broadband media. That means you'll have to bypass it, most likely through satellite links. And that's where cable has the upper hand over other broadband providers. Since you maintain satellite links with the most popular video programmers, you've got a built-in, broadband connection right to the content source.

"Content providers are already using satellites to deliver programming to the headend," says Kevin Lewis, senior director of marketing and strategy for **InfoLibria**, a Waltham, Mass.-based company that develops software to ensure high-quality data delivery. "The cable operator can simply set up a co-location facility to operate the content delivery networks to ensure the quality of the feed and take care of user requests as they come in."

- The next component is the ability to serve the content from your edge network. No special equipment is needed, simply a video engine and an encoding module, such as those provided by RealNetworks or **Microsoft**. The key consideration, or course, is scalability. As more users come online, you want to be able to service them properly without having to pour more money into new hardware.

"One server should be able to handle thousands of users and hundreds of titles simultaneously depending on disk space," Stuart Cassell, director of data product development at **Cox Communications**, says.

- Another crucial aspect is the content itself. As we mentioned, there is little out there tailored specifically for the broadband realm, and few providers are going to cater to broadband until the market is more substantial than today's 3 million broadband subscribers, with 2.2 million using cable modems. By 2001, subscribers are expected to approach 11 million, which many consider to be the beginning of a mass market.
- The final component is the playback device. Streaming media currently conjures up images of PC viewers watching video clips via cable or DSL modems. Today's set-tops generally

BOTTOMLINE

> Planning for Media Streaming

Media streaming will eventually be a key application separating the broadband universe from the rest of the Internet. Fortunately, few cable operators have to worry about rushing out a media streaming solution today, but you should be thinking about it.

Some key issues to ponder:

- How much bandwidth is needed to ensure high quality service?
- How will you overcome the slow speed of the Internet backbone?
- How will you beef up the headend and edge and distribution networks?
- How can you maximize the profitability of this new venture?

As with almost everything broadband, there are no hard and fast answers, and cable operators will have to do some pulling and tweaking with the technology and the revenue models. The end result is that media streaming will be a money-making opportunity that is likely to have an enthusiastic audience once you are ready to deliver.



Power You Can Depend On.

We enable technology, reliably.

15 distribution centers nationwide.

Same day delivery available.

EPA Certified recycling program for "spent" batteries.



Convergence?



>>> Not Without MK.



Available Through...



Toll Free: 1-88-Telewire • telewiresupply.com



Toll Free: 1-800-Fiber-Me

MK Battery

1645 South Sinclair Street • Anaheim, California 92806

Toll Free: 800-372-9253 • Fax: 714-937-0818 • E-Mail: sales@mkbattery.com

Key Components for Implementing a Broadband Media-Streaming Service

- 1) Offer a minimum bandwidth of between 300 kbps to 500 kbps for each encoder to ensure your network's video quality will satisfy both subscribers and content providers.
- 2) Develop an effective strategy to deliver video and audio streams to your edge network, by bypassing the regular Internet and using satellite links for a built-in, broadband connection to the content source.
- 3) Serve content from your edge network. No special equipment is needed, simply a video engine

- and an encoding module, but scalability is key. As more users come online, you'll need to be able to service them properly without having to pour more money into new hardware.
- 4) Customize content.
- 5) Choose a playback device that has the legs to deliver high-quality streaming video. Today that might mean using set-tops that use a client-server network running software based in the headend. In the future, properly equipped set-tops will be able to display full-motion video on their own.

don't have the legs to deliver high-quality streaming video, unless they are part of a client-server network running software based in the headend. But in the future, properly equipped set-tops will be able to display full-motion video on its own.

Computing-wise, there is going to be very little difference between the PC upstairs and the cable box downstairs. Streaming video is likely to take over the video-on-demand service that you currently run out of multiple servers and racks of equipment.

So how is anyone going to make any money? There are numerous options, and it may take the industry a while to figure out which ones work. First, there is traditional pay-per-view that we all know and love. There are also content-bundling packages, which provide viewers with on-demand access to particular blocks of programming, such as music videos or sitcom reruns, for a set fee. Of course, network operators and content providers will have to craft revenue-sharing deals so everyone gets a piece of the action.

And do not forget that streamed media can be made interactive, leading to numerous e-commerce opportunities. Just as links to shopping sites can be added to regular digital programming and advertising, streaming media lets users inquire about that new necklace Madonna is wearing, or the car in the latest James Bond flick.

"You can monetize (streamed media) on a frame-by-frame basis," SeelNow's Ram says. "It's a no-brainer of an economic comparison. No other solution has the benefits of online streaming."

Revenue can also be had from non-video forms of streamed data. Video-style games are a prime example. On-line gaming is one of the fastest-growing applications on the Web, and it won't take much space to cache a licensed software title on a local server and charge by the hour or a flat rate.

As we mentioned before, the key thing that cable operators must keep in mind regarding streaming media (or any broadband application) is scalability. Right now, no one needs to install a system that can handle a million simultaneous users. But any solution that does make its way into your headend, your edge or distribution network needs to scale up easily and at low cost as your broadband community grows. □

Arthur Cole is contributing editor to *Communications Technology*. He can be reached at acole602@aol.com.

Did this story help you? Let us know your thoughts. Send an e-mail to snayalkar@phillips.com.

Clean up that Headend!!



REDUNDANT POWER SUPPLY
(POWERS 16 LNB'S)



12 CHANNEL
POWER DIVIDER

**"Call us for all your Satellite Powering,
Routing and Conversion products"**

800-922-9200

www.megahz.com • engineering@megahz.com

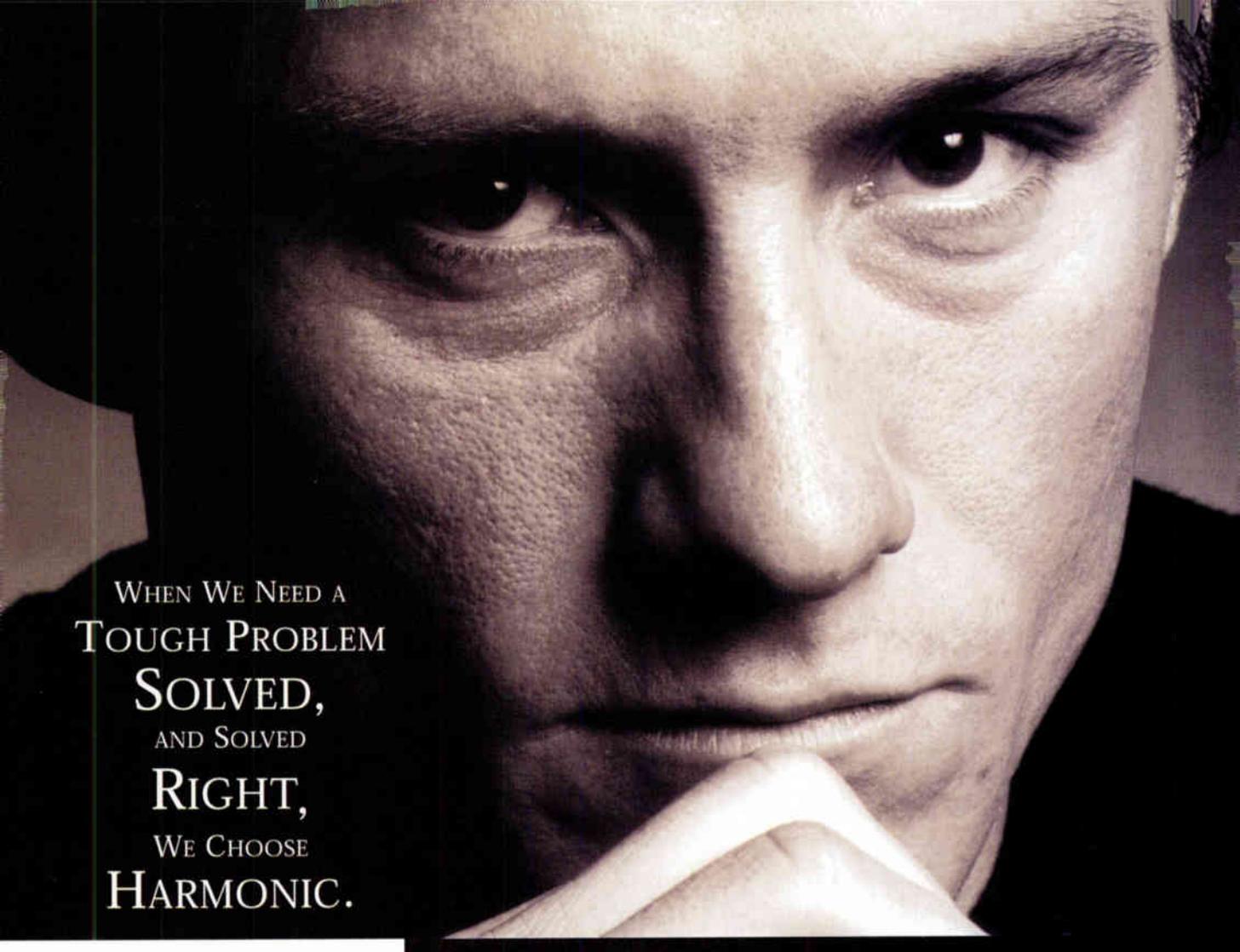
MHz[®]
MEGA HERTZ
Established 1975

STOCKS

QUINTECH[™]
Electronics and Communications Inc.

"Unique" Products For the 21st Century!

Oregon, Arizona, Colorado, Texas, Missouri, Ohio, Pennsylvania, Georgia, Florida, New Hampshire



WHEN WE NEED A
TOUGH PROBLEM
SOLVED,
AND SOLVED
RIGHT,
WE CHOOSE
HARMONIC.

**THE TOUGHER YOUR PROBLEM,
THE HARDER WE WORK.**

Face it, many companies provide broadband solutions. Unfortunately, few of these solutions work the way they're expected to. Which is why more and more broadband service providers are bringing their architectural problems to Harmonic. Simply put, our solutions work, 24 x 7.

**WE DELIVER BROADBAND INNOVATIONS –
FROM THE HEADEND ACROSS THE ENTIRE NETWORK**

Harmonic knows broadband networks inside and out. Our world-class expertise in advanced fiber optic networks and digital video systems helps service providers stay competitive and get to market faster with delivery of video, voice and data over broadband networks.

At Harmonic, we'll do whatever it takes to solve your toughest broadband problems quickly. Our digital and fiber optic engineers are technically astute, highly responsive, and totally committed to developing innovative optical networking, digital video systems, and high-speed data solutions that work.

No matter how difficult your broadband challenge may be, Harmonic can help solve it. For more information, visit www.harmonicinc.com. Or call us +1.408.542.2500.

CALL US ABOUT YOUR TOUGH PROBLEMS IN:
Optical Access Networks | Digital Video Systems
IP Data Gateways | Network Management
System Integration

Smart Solutions for Broadband Systems



Enhanced Broad New Opportunities with Delivery Over IP

By Jan van der Meer

The exciting technological news in enhanced broadcast services is that the combination of more bandwidth over Internet protocol (IP), falling prices for storage devices and new technology for coding and streaming of audio and video has yielded more opportunities.

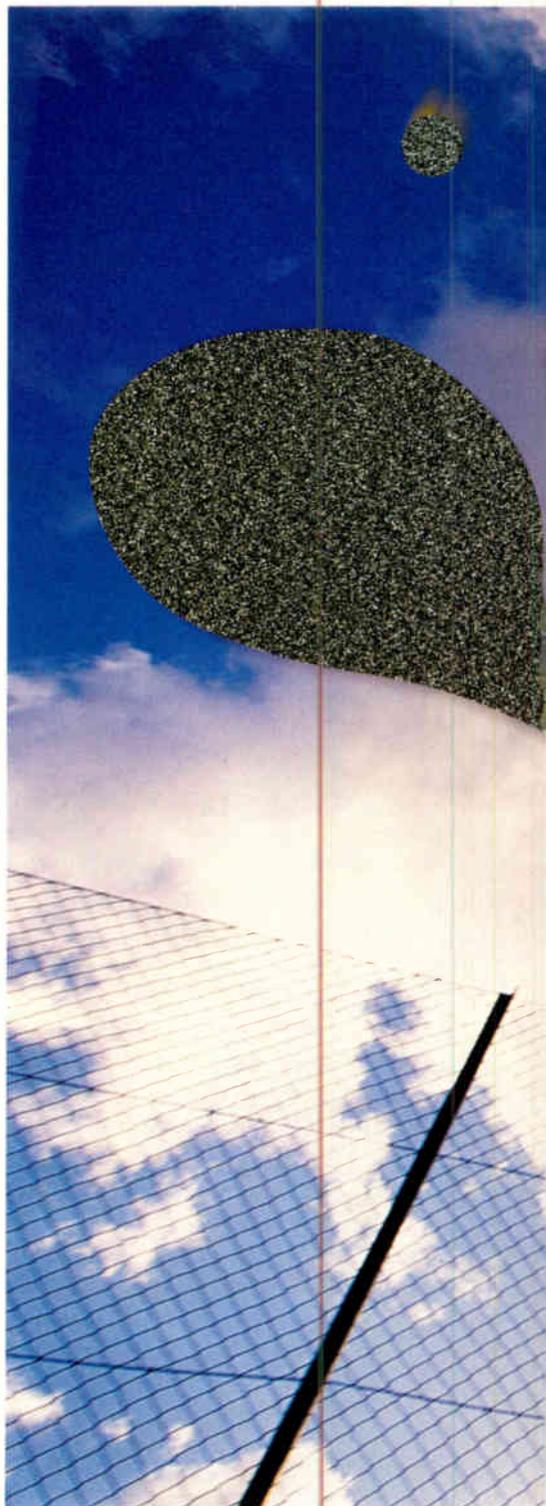
One of the technologies expected to play an important role in enhanced broadcast services with complementary delivery over IP is Moving Picture Expert Group 4 (MPEG-4), an object-oriented multimedia standard offering a variety of tools. In addition to providing tools for coding individual video, audio and graphical objects, MPEG-4 also provides facilities to compose an MPEG-4 scene from a set of such objects. The composition may vary in time and space, which is particularly powerful in the case of multimedia applications with behavior that is dynamic, yet unknown at application launch, such as covering a live sporting event.

To enhance an MPEG-2-based broadcast service, the MPEG-4 objects can be transported over the same MPEG-2 transport stream as the MPEG-2 audiovisual broadcast content. Typically this will be done for objects that need to be transported to all broadcast service viewers. However, transport over IP is possible too, and could be useful when transport is needed to one or more individual users only.

The MPEG-4 content can be played back immediately, but it is also possible to store one or more of the objects on a storage device in the set-top box for later playback, upon command from the user. Delivery and playback options can be exploited as deemed appropriate by the application.

MPEG-4 features

MPEG-4 is an International Standards Organization (ISO)/International Electrotechnical Commission (IEC) standard, defined by MPEG, the committee that earlier developed the Emmy Award-winning standards known as MPEG-1 and MPEG-2, which enables a large variety of digital video applications for compact discs, broadcast and digital video disc (DVD). MPEG-4 offers scalability and flexibility in combination with a high-coding efficiency over a large range of bandwidth.



Original photo ©2000 Eyewire

cast Services



10|00 CT65

Though there is some functional overlap between the two, MPEG-4 will not replace MPEG-2. At the bit rates and resolutions commonly utilized by MPEG-2 applications, there is no improvement in coding efficiency, and hence no justification to replace MPEG-2 with MPEG-4 tools. Instead, the MPEG-4 specification offers a new set of features that can be exploited to add value to existing MPEG-2 applications. In particular, the object-oriented approach of MPEG-4 enables the design of sophisticated multimedia applications.

Video

MPEG-4 video tools are capable of coding natural textures, images and video along with supporting arbitrary-shaped objects and the transparency of video objects. MPEG-4 video offers scalability and flexibility in combination with a high-coding efficiency over a large range of data rates, from as low as 5 kbps up to about 1 Mbps. This makes MPEG-4 especially suitable for video-streaming applications in environments where the available bandwidth may vary.

Coding of natural images and video is achieved in a way similar to con-

ventional MPEG-1 and MPEG-2 coding, using motion-compensated predictive discrete cosine transformation (DCT) technology, with a high-level of flexibility with respect to input formats, frame rates, pixel depth and bit rates. When compared with MPEG-1 and MPEG-2, motion-compensation technologies are enhanced to support very low bit rates. As a result, MPEG-4 is extremely efficient at very low bit rates, making the MPEG-4 standard the obvious choice for streaming media over the Internet.

“MPEG-4 scene composition is a powerful tool in designing multimedia applications.”

ventional MPEG-1 and MPEG-2 coding, using motion-compensated predictive discrete cosine transformation (DCT) technology, with a high-level of flexibility with respect to input formats, frame rates, pixel depth and bit rates. When compared with MPEG-1 and MPEG-2, motion-compensation technologies are enhanced to support very low bit rates. As a result, MPEG-4 is extremely efficient at very low bit rates, making the MPEG-4 standard the obvious choice for streaming media over the Internet.

In addition to MPEG-1 and MPEG-2 capabilities, MPEG-4 supports ar-

Graphics

bitrary-shaped objects and transparency of video objects. MPEG-4 also includes a dedicated coding scheme for textures and still images based on a very efficient and scalable wavelet algorithm. The MPEG-4 standard supports some 2-D and 3-D modeling techniques, as well as synthetic objects, such as the human face and body animation.

MPEG-4 defines a rich set of 2-D and 3-D graphical functions, largely based on Virtual Reality Mark-up Language (VRML). For applications requiring low-complexity graphics, a 2-D graphics profile is defined. For transport of graphical data, an efficient binary format has been specified that compresses VRML 2.0 data with a factor of typically 8 to 15. This format also allows for very low bit rate animations, typically at the bit rate of a few kbps.

Audio

MPEG-4 audio tools are able to code speech and music over a wide range of bit rates and sampling frequencies. The lowest bit rate range of the three different types of codecs is covered by parametric coding techniques: 2 kbps to 4 kbps for speech with a 8 kHz sampling frequency, and 4 kbps to 16 kbps for music with a sampling frequency of 8 kHz or 16 kHz. Speech coding at medium bit rates between about 6 kbps to 24 kbps uses code excited linear predictive (CELP) coding techniques. In this region, two sampling rates, 8 kHz and 16 kHz, are used to support narrowband and wideband speech, respectively. For bit rates starting below 16 kbps and typically up to 128 kbps for stereo, time-to-frequency (T/F) coding techniques are applied, with sampling frequencies, such as 8 kHz, 16 kHz, 24 kHz, 32 kHz and 48 kHz.

To support audio streaming over Internet with a range of available data

rates and a variable quality of service (QoS), MPEG-4 defined the scalable audio profile. Using this profile, it is possible to increase the audio quality seamlessly when more data capacity becomes available and decrease the audio quality gracefully when the available data capacity decreases.

Scenes

In addition to providing support for the coding of individual video, audio and graphical objects, MPEG-4 provides facilities to compose an MPEG-4 scene from a set of such objects. The composition may vary in time and space, which is particularly powerful in the case of dynamic multimedia applications, such as enhancing the broadcast of live sporting events. During such broadcasts, situations may occur resulting in an immediate change of the scene composition. MPEG-4 allows us to add and remove on the fly video objects simultaneously overlaid on the screen.

The necessary composition information is constructed using binary format for scene description (BIFS) and is coded and transmitted together with the media objects. BIFS provides MPEG-4 with a rich set of scene construction operators, including VRML graphics primitives that can be used to construct sophisticated scenes.

Delivery of MPEG-4 content over MPEG-2 systems and IP

MPEG-4 is an abstract standard that does not define transport mechanisms. For interoperable services, additional specifications are needed to define transport of MPEG-4 data. The MPEG committee defined how to carry MPEG-4 content over MPEG-2 system streams in Amendment 7 of the MPEG-2 system specification. The Internet Engineering Task Force (IETF)-defined carriage of MPEG-4 over IP in a joint effort with the MPEG committee.

Enhanced MPEG-2 programs with MPEG-4 content

Within MPEG-2 transport streams, the program map table (PMT) is used to define which elementary

SEE WHY COSMOCOM HAS 50% OF ITS MARKET*

ONE MORE BEAUTIFUL REASON TO VISIT
WWW.COSMOCOM.COM

Everybody else's
"Integrated"
Contact
Center



CosmoCom's
Unified
IP Contact
Center



***According to Frost and Sullivan's new study, US Web-Enabled Call Center Markets, CosmoCall Universe leads the IP-ACD segment with 50% of the market.**

CosmoCall Universe is a high-end, e-customer communication platform that was designed from the ground up for serious e-businesses and their service providers.

Don't settle for so-called "integrated" systems built around obsolete technology when a whole new generation is available.

If you're doing business the "e" way, you should be building your contact center with CosmoCall Universe, the technology and market leader.

Visit www.cosmocom.com
or call toll free (877) 867-5419



streams form a program. Within the PMT, reference can be made to MPEG-4 content which may represent an individual MPEG-4 elementary stream, or an MPEG-4 scene with one or more MPEG-4 objects.

Individual MPEG-4 elementary streams

An individual MPEG-4 stream may represent an MPEG-4-encoded complementary speech channel or low-frame-rate video of a small size for overlay on a full screen MPEG-2 video. Each individual MPEG-4 audio and visual stream is carried in packetized elementary stream (PES) packets. In the PES header, protocol type selections (PTSs) are encoded in the same way as for MPEG-2 elementary streams, based on the MPEG-2 system time clock. In this way, the decoding and presentation of the individual MPEG-4 elementary stream is defined directly in terms of the MPEG-2 time base.

MPEG-4 scenes and objects

To identify the MPEG-4 objects that are to be composed into an MPEG-4 scene, a unique parameter used to identify the elementary stream, or ES_ID, assigned to each MPEG-4 object. An MPEG-4 object may represent audio, video, text, graphics or other content. An MPEG-4 object is not required to be MPEG-4-encoded. An MPEG-2 video or audio stream, for example, can be an MPEG-4 object.

MPEG-4 system streams

MPEG-4 audio and visual elementary streams can be carried directly in PES as individual MPEG-4 elementary streams. MPEG-4 system tools can be used to carry MPEG-4 content over MPEG-2, in particular synchronization layer (SL)-packetized streams and FlexMux streams.

In MPEG-4 systems, SL packets are the basic entity for carrying access units. Each SL packet carries

exactly one access unit, or a part thereof. The SL packet header contains time stamps and other data for the contained access unit. A sequence of SL packets with data from the same elementary stream is called an SL-packetized stream.

The MPEG-4 FlexMux tool is capable of multiplexing SL-packetized streams into a FlexMux stream, consisting of a sequence of FlexMux packets. Each SL-packetized stream in a FlexMux has its own channel, identified by a channel number coded in the header of the packet.

MPEG-4 time base(s)

In principle, each MPEG-4 object has its own time base. Elementary streams carried in PES without the use of MPEG-4 system streams are locked to the MPEG-2 system time clock (STC) in the same way as any MPEG-2 audio or video stream that is part of the same program. MPEG-4 elementary streams carried by MPEG-4 system streams have a time base with the following characteristics:

- The object-time base is locked to the MPEG-2 STC; and
- There is a fixed-time offset between the object time base and the MPEG-2 STC.

In this case, the object time base is carried either by the SL-packet header or by a specific FlexMux channel. The time offset between the object-time base is defined through the use of MPEG-2 and MPEG-4 time stamps.

Complementary delivery over IP

Once developed, an MPEG-4 application requires transport of MPEG-4 content. If the streams are intended for broadcast to many clients, transport over MPEG-2 may be suitable, but single-client content delivery may be more efficient over IP. Both delivery methods are complementary options.

The IETF and the MPEG committee specify delivery of SL-packetized streams and FlexMux streams over IP. MPEG-4 allows the content to be authored independently of the deliv-

Headend Products



C8U Dual Channel Upconverters



C6M-II 1 GHz Modulator



S450M (MODULATOR) S450 P (PROCESSOR) S890D (DEMODULATOR)

"Call us for all your Headend requirements!"

800-922-9200

www.megahz.com • engineering@megahz.com



STOCKS



MOTOROLA

"Unique" Products For the 21st Century!

Oregon, Arizona, Colorado, Texas, Missouri, Ohio, Pennsylvania, Georgia, Florida, New Hampshire

[to serve and protect.]



That's the job of this SeaChange MPEG-2 video server. To safeguard the heart of your operation, your digital assets. Today SeaChange is the global leader in MPEG-2 digital video systems. Our servers are out in force, covering over 30,000 channels worldwide. With ironclad, scalable solutions for broadcast, broadband and Internet, you can manage your most demanding applications and a variety of content—including play-to-air, video-on-demand, digital advertising and Internet streaming. What's more, the patented design of the SeaChange MediaCluster will keep

you on the air all the time, offering the highest fault-resilience in the industry without costly mirroring. Which saves you the expense and complexity of working with redundant servers. So in addition to protecting your digital assets, SeaChange also protects your revenue streams, your technology investment and your business. And you have that from a reliable source.



Changing television for good.

ery method. The application requires content authored under the same conditions as for delivery over MPEG-2, and therefore the format of constructed SL-packetized and Flex-Mux streams is fully transparent to transport over MPEG-2 or IP. The end-to-end delay for delivery over IP may be significantly larger, however.

Examples of applications

MPEG-4 scene composition is a powerful tool in designing multimedia applications. It specifies how video, audio, graphics and other objects relate in time and space. There are four examples of multimedia applications designed to enhance digital broadcast services.

Audience attractor

We can use MPEG-4 to generate revenue in a pay-TV environment. Instead of the conventional way of broadcasting a tennis match with a single full-screen video stream and a single audio stream, the broadcast can be composed of multiple objects:

- Two tennis players as two foreground video objects;
- The tennis stadium as a background video object;
- An audio object with a commentary voice; and
- The ambient sound in the stadium as a background audio object.

The pay-TV coverage of the event could broadcast the background objects along with the tennis stadium with its ambient sound for free to attract a target audience. Upon payment, the tennis players and the commentary voice are added to the background.

Personalized advertising

Working from the the tennis example, we can broadcast advertisement boards as texture objects within the background object. The advertisements on the boards could depend on the geographic location and profile of the consumer being targeted.

Immersive sports coverage

Things can get very interesting for the sports fan with enhanced broadcast technologies. Today, major sporting events are covered with one or more digital broadcasts. Each broadcast consists of the usual full-screen video and associated audio streams. Suppose that in addition to the usual broadcasts, other streams are provided too, such as one or more of the following small-size pictures that can be overlaid on the full-screen video. These overlaid pictures may or may not have associated audio, and may represent one or more of the following:

- Coverage of a simultaneously ongoing game;
- Status of the game at different positions;
- Performance of a specific player;
- Highlights of the game up until a given point in time;

Belden®+TVCcommunications®=Completeconnection

YOUR COMPLETE CABLING CONNECTION



Belden

When you choose Belden®, you're sure to get the exact cable you need, whatever your application. Belden offers the industry's largest selection of quality cables, including multi-conductor, paired and coaxial cables in plenum and non-plenum versions, fiber optic cables and accessories. An authorized full-line Belden distributor, TVC carries a comprehensive inventory of products for a variety of physical and electrical performance requirements.

TVC Communications

Delivering the Future of Communications

Corporate Office: 800 Airport Road, Annville, PA 17003 USA
(717) 838-3306 • www.tvcinc.com

Northeast - Hershey, PA
Central-Indianapolis, IN West-San Clemente, CA
Southwest-Houston, TX Southeast-Sarasota, FL
TVC Technology Center - Chambersburg, PA

HIGH-END PERFORMANCE AT HARD WORKING PRICES

Trilithic's new
Signal Level Meter
is cost effective,
easy-to-use,
and ready to ship

You don't usually find Signal Level Meters with features like all-channel scan displays, direct power measurements of QAM signals, carrier-to-noise measurements, and automated FCC testing at this low price; or in such a lightweight, easy-to-use, and built-to-survive the-street package. Throw in the fact that The Model One is in our warehouse, ready and waiting to be shipped, and you've got a combination that's ready to go to work.



 **TRILITHIC**

Call Now To Order The Model One

317.895.3600 • 800.344.2412

- Summary of a previous game; and
- Replay of game events.

The additional content could be available in a number of ways, such as broadcast, or stored locally, or on a server. In case the additional content is intended for a broad audience, it would likely be delivered over the broadcast channel. In cases

of delivery to a single user or a small group, the content may be delivered more efficiently over IP.

Should the user wish, they can ask for highlights, keep an eye on the progress of simultaneous games, have a look at the performance of their favorite player and have a replay of what happened earlier. We

have given the user a choice between watching the event in the usual lean-back position (without additional digital streams) or having an exciting multimedia experience in a more lean-forward position.

Enhanced EPG

Assume a bouquet of digital broadcast services offered over a medium, such as cable. For user convenience and promotional purposes, an enhanced electronic program guide (EPG) is offered and can be overlaid on top of any of the selected broadcast programs, exploiting the transparency and arbitrary shape features of MPEG-4. The EPG shows a vertical axis that lists all available services and a horizontal axis that represents time. The user can conveniently select a service and a point in time and will receive information in a small window on what is broadcast by the selected service at the selected time. The information may be broadcast, stored locally or provided over IP. The user can select programs of a certain type and, when available, such programs are recommended to the user, either to watch or to store for later use.

Conclusion

The MPEG-4 standard provides a truly open specification with a large variety of features enabling powerful multimedia applications. MPEG-4 provides solutions for delivery over the Internet, but also provides a solution for highly customizable services, such as those provided by digital broadcasts. Using the same MPEG-4 standard, applications may exploit the strengths of both delivery methods as completely new ways of broadcasting become possible. **CT**

Jan van der Meer is technology manager for Philips Consumer Electronics. E-mail him at jan.vandermeer@philips.com.

Did this story help you? Let us know your thoughts. Send an e-mail to snayalkar@phillips.com.

Tyco®+TVCcommunications®=The deal

SEAL THE DEAL



tyco
Electronics

FOSC 400 closures, with their highly reliable sealing system and proven fiber management hardware, are designed for use with any cable construction.

Environmentally sealed to protect sensitive connector interfaces, FibrBoss Customer Premises boxes provide a high quality and flexible fiber management platform for transitioning outside plant cable to inside cable and connectorized assemblies.



TVC
Communications

Delivering the *Future* of Communications

Corporate Office: 800 Airport Road, Annville, PA 17003 USA
(717) 838-3306 • www.tvcinc.com

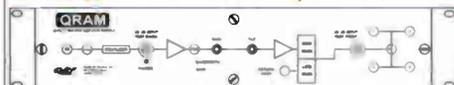
Northeast - Hershey, PA
Central-Indianapolis, IN West-San Clemente, CA
Southwest-Houston, TX Southeast-Sarasota, FL
TVC Technology Center-Chambersburg, PA

**750 / 870 MHz HEADEND & INDOOR AMPLIFIERS
450/550 MHz MODULES FOR JERROLD SJ & SLR
S-A, MAGNAVOX & PATHMAKER UPGRADE KITS**

QRAM-750/870

19" Rack-Mount Laser Driver Amp

870 MHz Feedforward, 30 & 34 dB



- Power-Double, Quadra-Power and Feedforward
- Bandwidths to 870 MHz
- Four Output Ports
- UPS DC Voltage Input
- U.L. Transformer

NEW Return Amp

NEW! QRBA200-25/8



- Eight independent amplifiers, 25 dB gain
- Input pad & equalizer on each amplifier
- 5 MHz to 200 MHz return bandwidth
- Push-pull low-current plug-in RF hybrids
- -30 dB Test Point on each amplifier

QDAXF 750/870-2Way



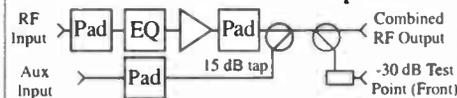
- Deluxe MDU/Hotel Amp
- Power-Doubled or Quad-Power to 750 & 870 MHz.
- Plug-in hybrids, pad & EQ
- Interstage EQ for Hi-Slope
- Optional Reverse Amps.
- 5/8 inch cable entry
- U.L. Power Transformer
- 7" x 9" wall mount chassis

We also build traditional QDAX models with slope and gain controls in 450, 550, 750, and 870 MHz bandwidths. Return bandwidth for all 750/870 MHz units is 5 MHz to 40 MHz.

Laser Isolation Amp



QRBA/QRCIA • 50, 200, 550, 750, 870 MHz!
Up to Five amplifiers, 3.5 x 19-inch chassis!
Push-pull, high isolation, 13 to 28 dB gain.
Power-doubled models! AC or DC power.



Power-Doubled Amp



QRBA • 550, 750, 870 MHz power-doubled model similar to our standard QRBA, but with THREE 20 dB power-doubled hybrids instead of the normal 5 push-pull hybrids. Better performance when higher output is needed! Five heat sinks, three amplifiers to operate at +34 to +36 dBmV output levels!

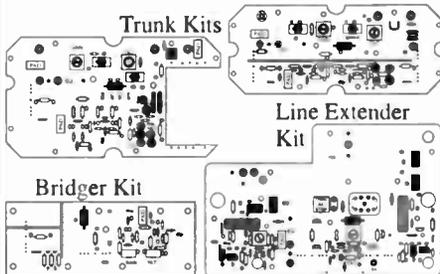
Return Isolation Amp



QISO/R75-32 • 5 to 75 MHz! Get Eight independent 4-port isolation amplifiers in one 5.25" x 19" chassis! Monolithic amplifiers, 50 dB splitter isolation, unity gain, loop-thru for more splits. +24 VDC power or an AC model. Up to 32 isolated, 20 dB return loss outputs.

Philips / Magnavox

- ALL 5-series modules upgrade to 550 MHz!
- Kits available w/Push-Pull, Power-Doubled, or Feedforward 550 MHz hybrids.



QRF converts 5-MC chassis to 550 MHz!

For Pathmaker

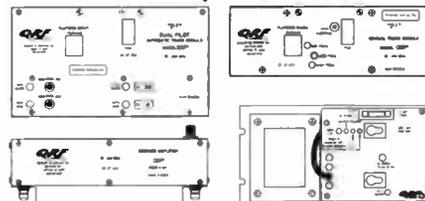
- Ask about our return amplifier for all the Pathmaker models.
- Full 450 MHz upgrade from 300/330 MHz.
- QSYLA kits for 152, Push-Pull or Power-Doubled Hybrids, 29 dB to 37 dB Gain.
- QSYLM kits for 211 styles, Push-pull and Power-Double, gain from 30 dB to 43 dB.

Hybrid Upgrades

- Upgrades for ALL brands of hybrid CATV amplifiers.
- Many can be Power-Doubled

For Jerrold SJ-450

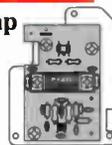
- QRF trunk and bridger modules replace SJ-450B modules. Trunk slope is 4 dB. Flat gain versions also available.
- ALL modules available with Push-Pull or Power-Doubled Hybrids. -23 or -27 VDC



- QSP AGC/Slope module. 30 & 34 dB gain
- QMP Manual Module. 32 dB Gain (Max)
- QBP Bridger has -30 dB Trunk Test Point
- Solid metal design allows Power-Doubled output NEVER OFFERED by Jerrold.
- QPP Power Pack for TWO PD Modules
- Transformer tap indicator LEDs assure maximum efficiency @ -23 or -27 volts.

QTRAQ Manual Return Amp

- Push-Pull Quad. 5 to 120 MHz
- 22 dB Gain, SXP Pad Socket
- Replaces Jerrold TRA-30M & TRA-108M. Only \$62.50!



QRF has push-pull and power-doubled 450 & 550 MHz replacement modules for SLR.

QRF has SJ550 MHz

Now Accepted Worldwide!

Quality RF Services is not a sales agent for Jerrold, Philips/Magnavox or Texscan.

American Express cards are accepted for World-Wide Shipments!



QUALITY RF SERVICES, INC.

**850 PARKWAY STREET
JUPITER, FL 33477**

561-747-4998

FAX 561-744-4618

800-327-9767



Delivering Quality of Service (QoS):

Quelling the Skeptics

Many in the technology community are not convinced quality of service (QoS) can exist in a routed network. In fact, QoS is alive and well, and implementing it in your system could improve reliability.

Ironically, one of the more difficult aspects of QoS is getting engineers to believe that it can exist in a routed network, although the community has become a bit less skeptical now that voice systems are becoming more important to cable networks, Mark Bakies, **Cisco Systems'** manager of product marketing for Internet protocol (IP), said in a wide-ranging interview with our editors.

QoS systems prioritize network services, he said, giving the most vital services top priority, by color-coding packets. This is essential when bandwidth is scarce, and deterministic QoS models help guarantee that there's enough bandwidth allocated for services.

An edited version of Bakies' interview follows:

Communications Technology: What factors do you have to consider when starting a QoS system?

Mark Bakies: The first thing you have... to understand is what your end-to-end network looks like. You have to have this end view of your network and take a step back to make sure that QoS may be provided essentially for all the paths by each and every element in the network. Each router would need to be able to offer a QoS treatment to the packets that are a certain color. When you provide QoS to the network, the packets are marked so you can tell what kind of treatment they deserve. We generally refer to that as coloring the packets. So, for example, red packets could be placed in a really fast, high-priority queue;

brown packets could be placed in a really slow best-effort queue.

Then, you need to look at the network and decide if you can even apply QoS to it. Essentially, each of the network elements—the routers

“QoS end-to-end is only as strong as the weakest link in the chain.”

and the switches—needs to be able to offer QoS. If you have a router in the middle of the network that doesn't have the capability of offering a QoS, then you have a weak link in the chain.

If things get congested, you won't have the ability to take the red packets and move them right to the front of the queue or expedite their path.

You have to think of it as a chain. Every network element is a link in that chain. QoS end-to-end is only as strong as the weakest link in the chain.

Once you've got this picture of your network, what's next?

You have to look at the service itself. Let's take a multiple system operator (MSO) as an example. Let's say they've got 200,000 homes and they want to

offer telephony service. They have to know how to activate QoS on all the individual routers, but they also need to make sure the routers themselves can

offer enough QoS for all the potential traffic that might be generated by these 200,000 people. So, they're really taking a service view. They've figured out the capability of their network, now you're sitting here going, residential telephony service—“if I market this really hard, what might my penetration rate be, how many phone calls are they likely to make a day?” More important, how many phone calls are they likely to make simultaneously in the busy hours of the day? And the next thing that comes into play is, how long is that phone call? There's a traffic en-

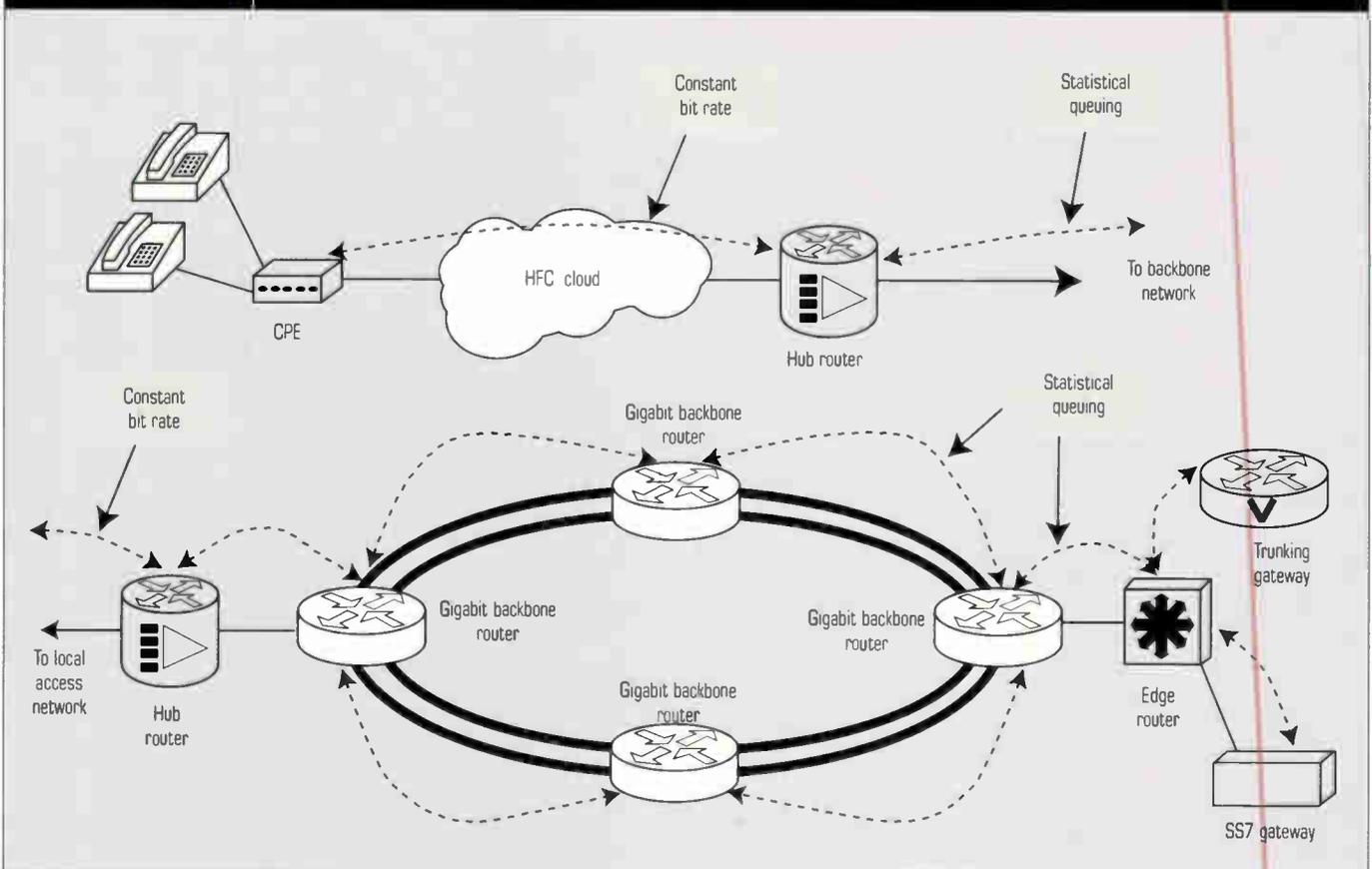
gineering function here that you have to go through. You can make QoS a purely software function by keeping track of pointers and their order in the queue and the routers.

Accommodating expansion

What if more people suddenly get interested in telephony, and the size of the subscriber base jumps up by a few percentage points? Is our hypothetical system alright as is, or do we have to make modifications to it to keep the same QoS pledges going?

In a cable plant, if we take part of the spectrum and we turn it into an IP network, what happens is that in the Data Over Cable Service Interface Specification (DOCSIS) protocol, we have the ability to reserve a chunk of bandwidth and dedicate it to a phone call. The amount of data that can pass through that spectrum largely depends on how clean or noisy that spectrum is. If it turns out there's no noise on it, you can use tighter modulation schemes that allow you to actually transmit more data. >

FIGURE 1 ADDRESSING QoS IN A VOIP OVER CABLE NETWORK



QoS: One HFC Network, Multiple Revenue Streams

By delivering end-to-end QoS controls using the Broadband Services Router (BSR) family from RiverDelta Networks, you can expand your customer base by offering a wide variety of business and residential services, build increased customer loyalty by offering bundled services supporting voice, data, audio, and video traffic, and create multiple revenue streams from your cable network. **Please download our whitepaper and learn how to leverage QoS to create multiple revenue streams.**



Business Applications
Access Internet
Media
Data
Voice
VPNs
Streaming Video

Applications Business
Internet Access
Media
Data
Voice
VPNs
Streaming video



www.riverdelta.com or 978.858.2300

 **RiverDelta**
NETWORKS

The DOCSIS protocol allows you to reserve, completely set aside, and essentially create a constant bit rate service. When you're managing a residential telephony service over cable, you have to know where your engineering rules are, that have to take into account other services that are running on that cable plan.

Say you're selling a high-speed Internet access service. In the busy hour, you would not want all the bandwidth to be consumed by voice

“QoS is what allows us to go and take some bandwidth and not allow it to be used by high-speed data service when we've got voice calls out.”

calls that are basically using all the bandwidth. You still want the guys doing high-speed data to have a reasonably decent experience. That bandwidth's not able to be shared by any other service, it's dedicated to the telephony operation on that plant. This is just an IP network and the bandwidth just gets consumed by the services that run there, and if it's a voice-over-IP (VoIP) service, it's free to consume the bandwidth just like high-speed data service.

QoS is what allows us to go and take some bandwidth and not allow it to be used by high-speed data service when we've got voice calls out.

The way you control this in a cable world is by how many households are passed on an upstream. When you put voice on the network as well, we typically see people reduce the size of homes passed per upstream from 1,500 to 2,000 homes to something more around 500. So that's how when their service grows they accommodate that.

There are other things you can do in a VoIP world that you can't do in a traditional time division multiplexing [TDM] or circuit-switched world. One is we can run different coding that can generate different bit rates.

Coding for different bit rates

What's the advantage of that?

There's a trade-off that says if you use fewer bits to encode the voice, that the voice quality will actually go down because you have fewer bits representing the same amount of information. Cell phones, digital cell phones, they code your voice down to about 8 kilobits, sometimes a little less depending on your carrier. It turns out in a VoIP world, we can do the same thing.

Think about the telephone lines that come from the central office switch to your home—that circuit is actually designed for 64 kilobits. You can choose to use less, but the system,

because it's in a layer, just consumes that whether you use it or not. It's just built in to the physical structure of the switches and of the wires all the way through the network. So in the VoIP world, we just have this pool of bandwidth, all the IP services share that bandwidth. If a voice only needs 8 kilobits or 15 kilobits of data, that's all that gets taken out of the pool. All the rest of the bandwidth is available for others to use.

But when the bandwidth is scarce, that's when you need to have very deterministic QoS models. These are what people would refer to as guaranteed. It's guaranteed from the point of view that the bandwidth is allocated for the call and it remains in place for the duration of the call. Nobody can take it away.

Mistakes with QoS

What are some of the common mistakes designers make when thinking about QoS?

The most prevalent one, is that they don't do the traffic engineering quite right, so you can make a network design error. You forget how many you've already got on the network. You can configure things wrong. You can assume you have QoS on all the network elements, but maybe you really don't.

Other types of mistakes are a little more operational, not so much design. It's easy to make mistakes. Operations is an important part of being successful here—operations from the point of view of being able to configure everything and configuring consistently across the network, and from the point of being able to isolate a fault in the network, and being able to get those problems isolated and then fixed.

What happens if marketing does such a great job and instead of getting 10 percent of homes passed, you turn up with 30 percent? Have you had to deal with that and what have you done?

You just go in and you get a bigger, faster box that replaces it or you put another one beside it. The IP network naturally load-balances anyway, then you start sharing the load and then everything's back on line.

When you talk to others in the tech community, what are their QoS concerns?

The thing that is on most people's minds... is they aren't convinced QoS in a routed network actually exists. They're skeptical, they haven't seen very many networks where people actually run quality of service, they've never seen boxes that can color packets so the routers can pay attention to them and differentiate the queues in which they go in.

When do you think more people will accept QoS?

I think voice is actually making that happen, so I think you'll see it in the service provider community and the cable industry. We actually have several instances where we're running residential telephony trials. We've got one right now whose with 1,000 people turned up already and they're running QoS. I think once those success stories start getting out, then people will become a little bit more aware. It's starting to happen. **CT**

Did this story help you? Let us know your thoughts. Send an e-mail to snayalkar@phillips.com.

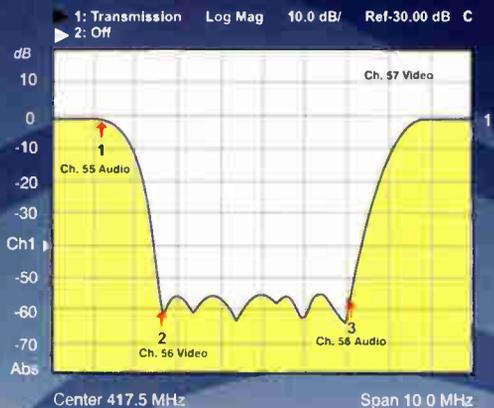
Channel Deletion Filters

Extremely high rejection (>55 dB) in a compact design!

Channels 2-54 Channels 55 +
750 MHz 860 MHz



Model: CD-9002-W



Model: CD-9002-R

The CD-9002 will delete an entire television or LAN channel and allow a new television channel or data to be reinserted.

Standard Features

- Extremely high rejection (>55 dB)
- Exceptionally low insertion loss (<1 dB typical, <1.5 dB QC)
- Excellent return loss (>16 dB)
- Low group delay
- Adjacent channel performance is preserved
- Rack or wall mount

* Custom designed filters available on request

Other PCI Filters

- Bandpass Filters
- Band Rejection Filters
- Split Band Filters
- High Performance Diplex Filters
- Low/Highpass Filters
- Brick Wall Low/Highpass Filters
- Pilot Carrier Traps



PCI

"Innovative solutions for Information networks"
PCI Technologies Inc.

Visit our website for details on PCI's complete line of products at www.pci.com

1-800-565-7488

www.pci.com sales@pci.com

CMTS

Take Your Network To A



Quality • Availability • Performance • Know-How

Introducing the advanced **CAS-2000.** One of the most powerful, feature-rich **CMTS** on the market.

Now you can take your network to one of the highest powers imaginable with Motorola's new high availability Cable Access System, the CAS-2000. With the CAS-2000, cable operators can now provide converged voice and data services over the HFC network with a scalable, cost effective system that is expected to provide 5 nines availability.*

All of which helps

you to meet the

ever-increasing demands of high-speed Internet and telephony users. The CAS-2000 raises the level of secure and dependable quality of service.



CAS-2000 features:

- Modular and scalable design
- DOCSIS 1.0 based
- DOCSIS 1.1 hardware ready
- Integrated management system
- Wide range of WAN interfaces including gigabit Ethernet and ATM
- 99.999% product availability (Q2, 2001)
- Hot swappable and redundant function modules

**Put the power of the new
CAS-2000 to work for you.**

**Contact your Motorola
sales representative at
800-523-6678 or visit us at
www.motorola.com/broadband.**

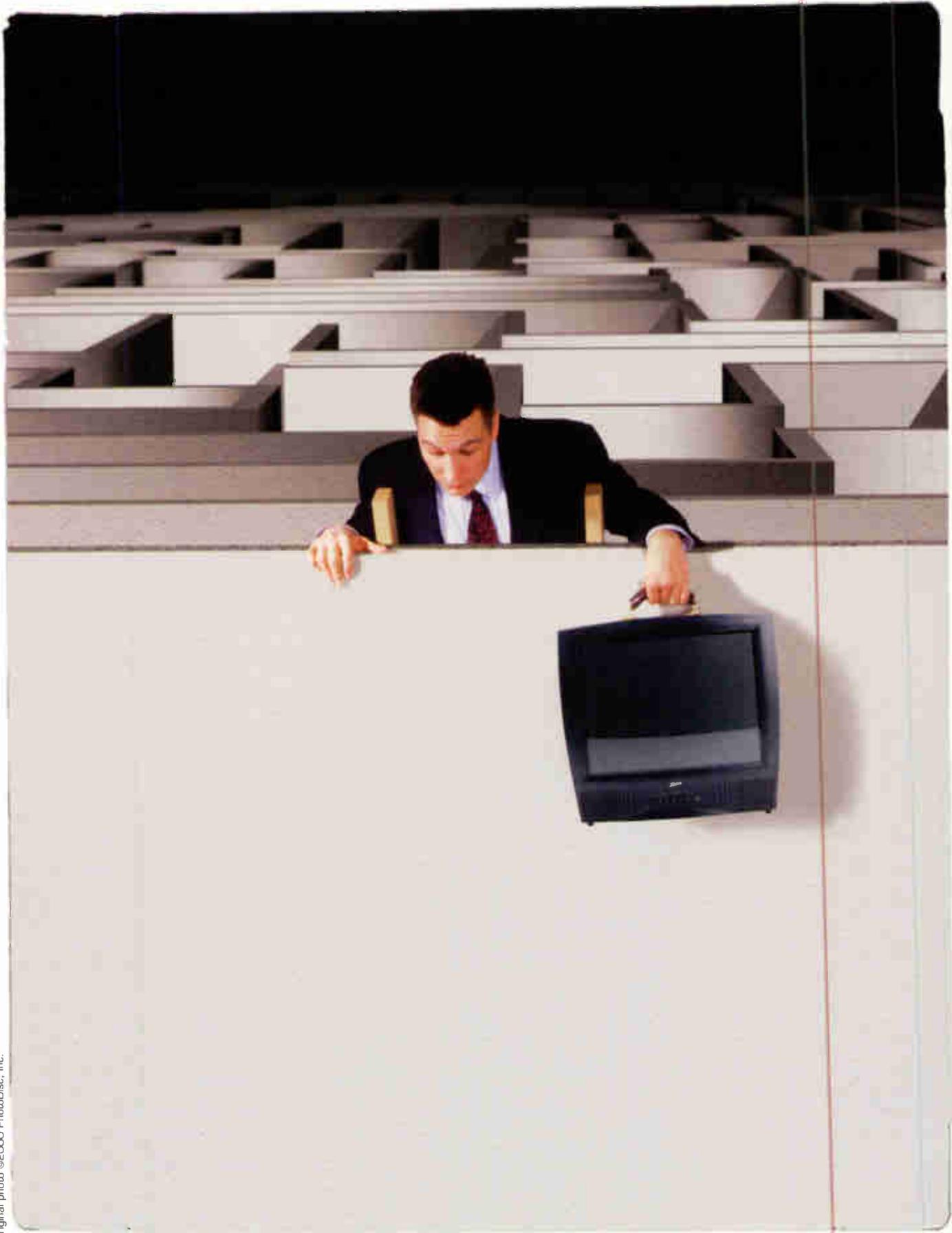
*Expected availability Q2, 2001

MOTOROLA and the Stylized M Logo are registered trademarks of Motorola, Inc. © Reg. U.S. Pat. & Tm. Off. © 2000 Motorola, Inc. All rights reserved. Made in the U.S.A.

Service • Support



MOTOROLA



Original photo ©2000 PhotoDisc, Inc.

82CT10|00

Planning for PODS

Versatile Solutions for Portable, Secure Digital TV

By Anthony J. Wasilewski

By allowing host terminals to become more generic, the OpenCable point of deployment (POD) module may play a critical role in any transition to the retail availability of set-tops.

The OpenCable POD module is an important component of the open standards specifications for digital TV. It supports the total separation of the conditional access system from the host terminal, while still supporting a wide array of features and applications, and providing high performance video/audio/data services. By allowing host terminals to become more generic, the POD may play a critical role in any transition to retail set-tops' availability.

To complete the support of an open platform for hosting a rich set of portable services, the application software environment of the host also needs to be standardized. The goal is to provide an environment in which a large measure of freedom-to-craft applications, with varied feature sets and powerful graphics, exists while also fostering a high degree of portability

of those applications to different hardware platforms.

This article describes an open set of middleware that includes:

- Hypertext markup language (HTML)
- Javascript [European Cellular Manufacturers Association (ECMAScript)]
- Multipurpose Internet Mail Extensions (MIME)
- Personal Java
- eXtensible markup language (XML)
- Hypertext transfer protocol (HTTP)
- Secure sockets layer (SSL)
- Document object model (DOM)
- eXtensible hypertext markup language (XHTML)
- Advanced television enhancement forum (ATVEF)

These middleware components can be or are being deployed on existing launched digital set-tops.

POD history/origins

The concept of using a removable device to encapsulate all security and conditional access processing has origins in both the digital video broadcasting (DVB) common interface process in Europe and the NRSS (National Renewable Security Standard). These efforts have been carried out by the joint engineering committees of **Consumer Electronics Association** (CEA) and the **National Cable Television Association** (NCTA) under the **Electronic Industry Association** (EIA) sanction in North America. Both groups eventually adopted a PC Card (PCMCIA) form factor, although the NRSS specification also includes an extended ISO 7816 smart-card format.

The POD extends both the DVB and NRSS standards by adding:

- Explicit handling of out-of-band

(OOB) data channels;

- A copy protection mechanism;
- An application interface; and
- Extensions for cable-ready applications.

Regulatory issues and timelines

From a regulatory viewpoint, the major influences on the existence of the POD have been:

- The Telecommunications Act of

The POD must support five different interfaces: PCMCIA, MPEG transport, an out-of-band channel (either Digital Audio Visual Council [DAVIC] or Motorola, formerly GI), the POD data channel and the POD extended channel. It must support traditional applications, such as digital broadcast and impulse pay-per-view (IPPV), but must also be capable of other OpenCable services such as video-on-demand (VOD). It must also be able to support the man-machine interface (MMI) of host applications utilizing a graphical interface based on HTML 3.2.

Figure 1 (page 86) illustrates a basic block

diagram for a POD module.

To fit the amount of functionality the POD specifications require into a small form factor, such as Type II PCMCIA, considerable integration in silicon is required. Much of the major components in the POD block diagram are found on an application-specific integrated circuit (ASIC). This chip, of course, has interfaces to memory and other chips, such as secure micro-processors to complete its mission.

Interface descriptions

The following are the classes of interfaces supported by an OpenCable POD module:

- Physical interface (PHY)
- Extended Channel
- Link Interface
- Application Interface

The PHY is compliant to the 68-pin PCMCIA interface. This supports parallel, full-duplex transmission of MPEG-2 transport streams at the bit rates typically deployed in North American cable TV systems. There is also support for signaling and CPU-to-CPU communication. Upon power-up, the POD performs the standard 16-bit PC card memory only initialization, after which the POD and host activate the POD module custom interface, which has a registered interface ID of hexadecimal 341. The POD also follows PC card power management standards.

The extended channel provides a data path between the POD and host

for information flows outside the MPEG-2 transport that are not terminated by the POD. For example, it supports the flows of Internet protocol (IP) packets or MPEG sections that have arrived for the host via OOB pathways from the headend.

Some data, such as entitlement management messages (EMMs) from the conditional access (CA) system, arrive over the OOB pathways and are not forwarded by the POD to the host.

The POD link interface is compliant with the command interface of the NRSS Part B specification. This implements a set of protocols that establishes communication about and to resources relating to conditional access, host control, MMI, copy protection, generic IPPV support and the extended channel. The link interface takes care of identification of flows and protocol

BOTTOMLINE

> Enhancing Portability

Two crucial requirements for support of retail digital set-tops are the ability to have hosts handle the appropriate conditional access system and application portability. The point of deployment (POD) module supports the total separation of the conditional access system from the host terminal while allowing a wide array of features and applications, and provides high performance video/audio/data services. By allowing host terminals to become more generic, the POD may play a critical role in any transition to the retail availability of set-tops.

An open software environment relies on standards enabling application portability between platforms. At least three major areas of support are needed to enable the desired portability: content rendering, network protocols and application code execution. These areas can be covered by an architecture of standardized middleware, including elements for presentation and application engines.

"The POD must support five different interfaces."

1996, requiring cable subscribers be given the option to own equipment needed to receive cable services; and

- The FCC's Report and Order (63 Fed. Reg. 38095) requiring cable operators to make separable security modules available by July 1, 2000, in order to facilitate commercial sale of navigational devices, such as set-tops.
- The industry responded by including in the **CableLabs'** OpenCable process, a working group to define the functionality for a POD module and its interfaces, and also to specify a suitable copy protection method that would be acceptable to content owners. This work has progressed well and manufacturers have responded by making available a suitable product within the FCC-mandated timeframe.

POD architecture and features

The POD handles both in-band Moving Pictures Experts Group (MPEG) transport and OOB control channels on behalf of the host device. One of its primary responsibilities for MPEG processing is the conditional access level decryption of subscriber-selected content for which the subscriber is authorized. The POD accomplishes this in conjunction with the cable TV headend through the implanted conditional access system. For the OOB channel, it interprets the format of the control bit stream that has been sent from OOB RF receivers in the host.

Cable Performers:

Amplifiers

Versatile, surface mount amplifiers for distribution, head end, cable modems, and other cable applications.

All you want in a CATV amplifier and more...high linearity, high reliability, low NF, flat gain slope, low voltage and all in a small, surface mount package at low **commercial prices**.

| Model | AH2 | AH22 | Units |
|------------|--------|----------------------------|-------|
| Frequency | 50-860 | 50-860 | MHz |
| CSO | -53* | -63** | dBc |
| CTB | -75* | -61** | dBc |
| IP2 | 48 | 70 | dBm |
| IP3 | 38 | 41 | dBm |
| Gain | 16.5 | 11.7 | dB |
| NF | 3.0 | 4.5 | dB |
| DC voltage | 5 | 5 | volts |
| Package | SOT89 | SOIC8 (Thermally enhanced) | |

*Measured at 30 dBmV output/channel, 83 channels.

**Measured at 40 dBmV output/channel, 110 channels.

Mixers

Super Spur Suppression Mixers for CATV Headends.

Great mixers at **commercial prices**. Check these out:

| Model | HMJ7 | SME1400B-17 | Units |
|------------------|-----------|-------------|-------|
| RF Frequency | 1000-2000 | 1-2200 | MHz |
| LO Frequency | 1000-2000 | 1-2200 | MHz |
| Spur Suppression | 60 | 55 | dBc |
| IIP3 | 35 | 27 | dBm |

For more information and data sheets, fax your request to 650-813-2447 or e-mail at wireless.info@wj.com.

1-800-WJ1-4401



WATKINS-JOHNSON

Visit us on the web at www.wj.com

Distributed In U.S.A. by Microwave Components: 800-282-4771; Nu Horizons Electronics: 888-747-6846; Richardson Electronics: 800-348-5580.
In Europe call WJ: +44-1252-661761 or your local Richardson Electronics Office: France: (01) 55 66 00 30; Germany: (089) 800 21 31; Italy: (055) 420 10 30 UK: (01753) 733010;

data unit (PDU) fragmentation.

The application interface is used to support cable-ready applications that use the data channel not defined or adequately covered by NRSS Part B. Such functions include host generic feature control, POD emergency recovery and specific application support. This interface defines the POD/Host MMI, additions to the low-speed communication interface, additions to the host control resource, additions to extended channel support, modifications to the generic IPPV resource and specific application support for hosts that have software download capability.

Copy protection

Because the POD processes (decrypts) and passes digital content streams to the host, suitable copy protection is required. If these content streams were sent in the clear over the PCMCIA interface to the host, it would be relatively straightforward to make exact digital copies of this content. To protect the bit streams as they flow from POD to host, the POD must apply additional encryption. While this is fairly simple to do, the POD is also required to authenticate the host to verify it has not been previously identified as an illegal device. This is accomplished through the use of digital certificates and signatures. In this manner, a highly secure form of key exchange may also be practiced.

Once the POD and host have agreed on keys to be used, the POD encrypts the MPEG-2 transport packets content that require copy protection as signaled in copy control information (CCI) bits, which are sent in authenticated form via the conditional access system.

Open software environment

The POD module only provides part of the solution for a portable application and content environment. There must also be a method providing content and application interoperability.

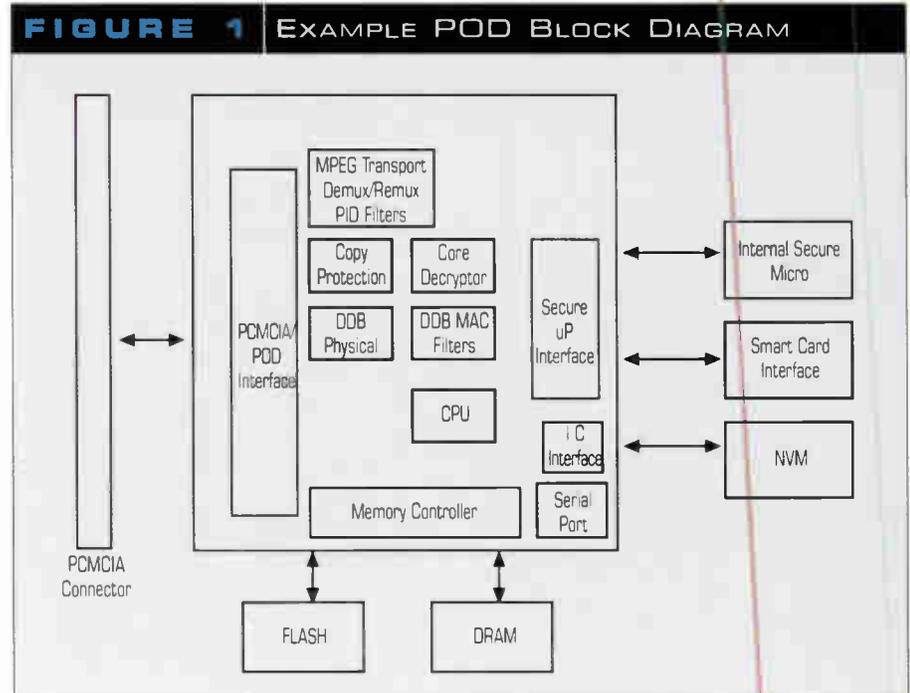
An open software environment relies on published standards that enable portability between platforms. If we begin with the assumption the transmission control protocol (TCP)/IP

suite will be the foundation for messaging, and client-server applications, data access, MPEG video and transport and Dolby AC-3 audio are the foundations for transmission of entertainment content, then portability concerns need to be focused on other aspects of the system. There are at least three

other major areas of support needed to enable the desired portability:

- Content rendering;
- Application code execution; and
- Network protocols.

These areas can be covered by an architecture that includes standardized



> References and Standards

The following are useful references for additional reading and information regarding the OpenCable POD and open middleware environments and standards:

- 1 Document markup language HTML 4.0, <http://www.w3.org/TR/REC-html40/>
- 2 Document scripting language ECMA Script, <http://www.ecma.ch/stand/ecma-262.htm>
- 3 Document Object Model DOM Level 0, <http://www.w3.org/DOM>
- 4 Hypertext Transfer Protocol (HTTP) 1.1 (RFC 2068), <ftp://ftp.isi.edu/in-notes/rfc2068.txt>
- 5 Aggregation & encoding of multiple resources into a single resource for delivery:
 - MIME multipart/related, [- <notes/rfc/files/rfc2387.txt>
 - MIME HTML \(rfc2110\), <ftp://ftp.isi.edu/in-notes/rfc2110.txt>
 - 6 Extensible Markup Language \(XML\) 1.0 Specification, <http://www.w3.org/TR/REC-xml>
 - 7 OpenCable Host-POD Interface Specification, IS-POD-I31-INT01-991027
 - 8 NRSS Part B Specification, EIA-679-A, Part B
 - 9 OpenCable POD Copy Protection Specification, IS-POD-CP-INT01-000107
 - 10 Java Specification, <http://www.javasoft.com/about-java/communityprocess/maintenance/JLS/index.html>
 - 11 ATVEF Specification, \[http://www.atvef.com/library/spec1_1a.html\]\(http://www.atvef.com/library/spec1_1a.html\)](http://info.internet.isi.edu/in-

</div>
<div data-bbox=)

A PARTNER YOU CAN TRUST FOR PROFESSIONAL HEADEND SOLUTIONS...

DRAKE



Drake offers a full line of professional headend equipment for those who demand **quality** and **value**.



Every Drake product is supported by a **tradition** of unmatched service and expert advice, so you can feel **confident** about your headend choice.



Call us today to find out how we can help you match the right products or system to your specific requirements.

**The Industry Leader for
Professional Headend Equipment
and Accessories**

**Coming Soon - Digital Headend Products.
See our website for details.**

DRAKE
DIGITAL



R.L. Drake Company
230 Industrial Dr.
Franklin, OH 45005-4496 U.S.A.

PHONE: 513-746-4556

FAX: 513-743-4510

WORLD WIDE WEB SITE: www.rldrake.com

DRAKE

elements for the following functions:

- Presentation engine; and
- Application engine.

In addition, the platform would require elements providing the following functionality on behalf of applications:

- Network services; and
- Platform services.

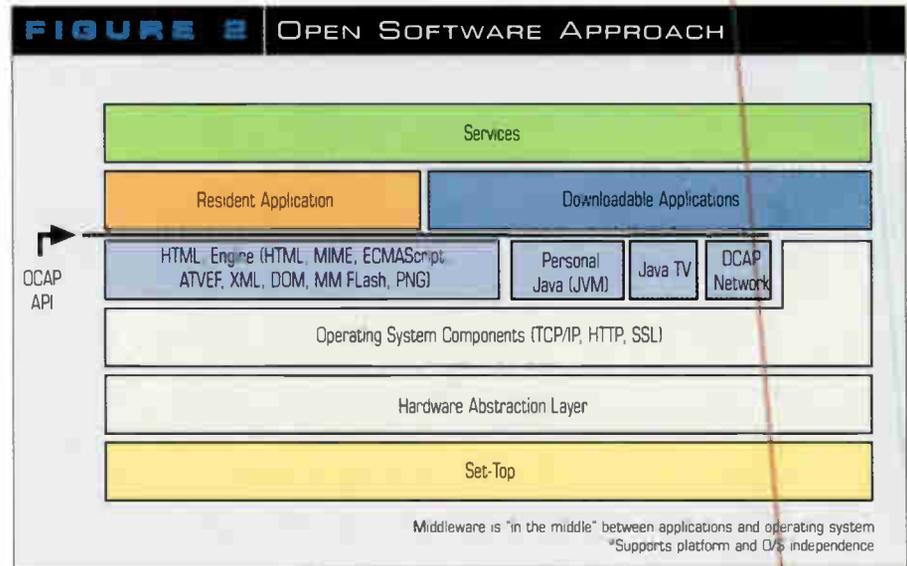
Ideally, these network and platform services would be supplied via an operating system that, in conjunction with middleware, completely abstracts details of the underlying hardware platform and network, and permits applications to migrate between platforms with little or no modification. The operating system may or may not be a standardized element. However, it is likely that within any one multiple system operator (MSO) system headend, only one operating system would be deployed.

A layered model of an interoperable software environment for a host device is shown in **Figure 2**. In this figure,

the middleware components are located between the applications and the operating system (that is, in the middle, hence the term middleware). The foundations of the middleware are the presentation engine components: HTML, MIME, ECMAScript, ATVEF, DOM and the application en-

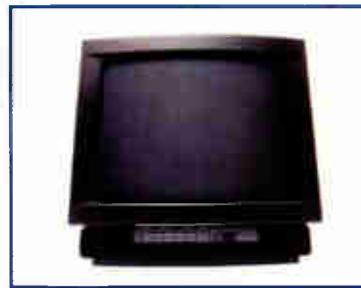
gine PersonalJava. Examples of extensions to the middleware are Java, TV classes and the Advanced Technical Systems Committee (ATSC) digital TV application software environment (DASE), which has been defined by the S17 Group of ATSC. >

MIME provides useful standards for



WE DON'T HAVE THESE AT **KES!**

KLUNGNESS ELECTRONIC SUPPLY



We do have..

E v e r y t h i n g e l s e .

OK, so we don't carry satellites or TVs, but for everything in between, call KES.

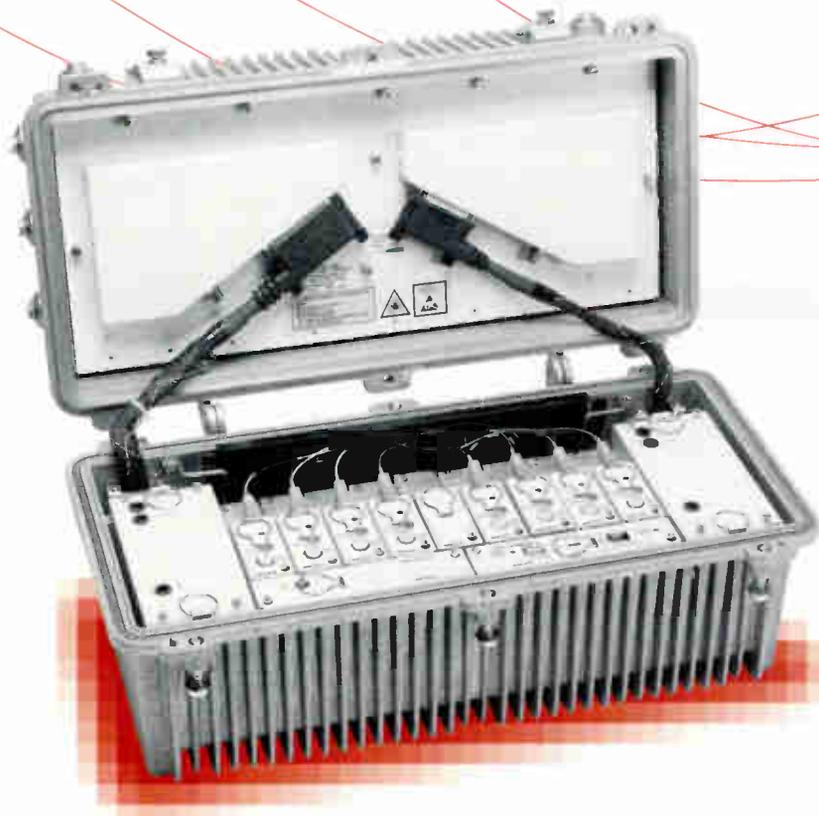
- From earth stations to set-top boxes,
- you'll get your gear when you need it,
- with the technical know-how to back it up.

Distributors for DOCSIS Compliant Cable Modems

The Broadband Integration Experts. On Time. On Budget. On Call.

1-800-338-9292 www.ccikes.com

REVOLUTION



PROVIDE A SCALEABLE BROADBAND SOLUTION



THE PROTEUS™ OFFERS FLEXIBILITY, MODULARITY AND PERFORMANCE.

As your interactive service penetration increases, the Proteus™ can be reconfigured to effectively quadruple your bandwidth in a serving area. It allows segmentation in both the forward and return path as well as providing full two-way redundancy. This revolutionary product is the low cost, four-output optical node solution for your network deployment.

We're setting the standard for the next generation of optical networks.

678-473-2000

WWW.ANTEC.COM

OPTICAL

DIGITAL

ANTEC

content rendering such as joint photographic experts group (JPEG), portable network graphics (PNG) and audio standards, such as WAV and AIFF.

DOM is a platform- and language-neutral model that allows programs and scripts to dynamically access and update content. DOM provides a map of a document's structure and style and

supports generic access to its parts. Combining DOM with ECMAScript is equivalent to Javascript 1.1.

ATVEF is a cross-industry alliance of companies that has defined protocols for HTML that may be used to deliver enhanced programming over many transports to a range of intelligent receivers. These enhancements

include announcement protocols, and trigger handling for real-time events and a local identifier uniform resource locator (URL) scheme.

XML is a very promising addition to the markup language approach started in HTML, and supports the separation of the data definition from the description of how it should be displayed. This promotes more dynamic content, as well as provides strong portability since rendering can be specified for TV-based or print-oriented graphics, speech synthesis or even Braille without changing the content coding. It also supports domain-specific data definitions that can be used to formulate standardized formats for specific types of data, so all applications can use and interchange the same data.

Further capitalizing on this separation of content definition and rendering is XHTML, which is a reformulation of HTML 4.0 as an application of XML 1.0. It has the advantage of being easily extensible, which allows applications to be updated with relatively little effort and it is designed to be highly portable so content can be transferred to many diverse platforms (PCs, wireless phones, PDAs, TVs and so on) and be acceptably displayed without modification.

The application engine is a complete execution environment within itself. One example is PersonalJava, or pJava, one of the Java application environments developed by the Javasoft division of Sun Microsystems, Inc. Java is implemented on a host device as a virtual machine. This is a software program that executes byte codes, which are standardized instructions for the machine. As long as a Java Virtual Machine (JVM) is available for a platform applications written in the Java language can be readily ported to that platform. The JVM also provides a security framework to ensure that downloadable "renegade" applications do not wreak havoc on the host platform.

The operating system components supply the interface and abstraction of the hardware components of the host device. Applications and the middleware layer need not concern themselves with the details of different

NOW
Shipping!

Solve Cable Modem & DVOD Headend Rack Space Problems

**SMNP Manageable
High Density QAM Upconverter**



WAVECOM

QHD4040

\$5200 (US)

- ▶ 44.00 MHz IF Input ; 88 to 857 MHz RF Output
- ▶ 4 independent frequency agile Upconverters in 1U
- ▶ Remote Control via RS232/RS485 or optional SNMP (10Base-T Ethernet)
- ▶ Exceeds requirements for DOCSIS Cable Modem Deployment & MPEG2 Digital Video Transport
- ▶ Front Panel RF & IF monitor points
- ▶ Standard 110 to 240 VAC (50/60 Hz) or optional -48 VDC power supplies; redundancy optional
- ▶ FLASH memory for fast, easy user software updates (via Internet)



WAVECOM

ELECTRONICS INC.

222 Cardinal Cres., Saskatoon, Canada S7L 6H8
 ph: (306) 955-7075 fax: (306) 955-9919
 email: sales@WaveCom.ca web: www.WaveCom.ca



NEW WORLD
ECOSYSTEM

Cisco, Cisco Systems, the Cisco Systems Logo and the Cisco Systems New World Ecosystem Logo are trademarks of Cisco Systems, Inc. or its affiliates in the U.S. and certain other countries.

Gotta Get a Gator



CABLE GATOR™ Center Conductor Cleaner

As a manufacturer of cable installation tools, Ben Hughes/Cable Prep was approached by technicians and linemen throughout the industry to produce a center conductor cleaner. The prevailing factor was the need to eliminate cleaning the bonded dielectric from center conductors with knives or other scraping methods without causing installation problems. By listening carefully to the comments and suggestions offered, Cable Prep has responded with the Cable Gator™.

There is a beveler that performs the pyramid cut to remove the burrs. If the center conductor burrs aren't removed, damage to the seizing mechanism of the connector can occur. Scoring of the copper-clad coating on the center conductor results in signal loss. In two easy steps the Gator bevels the center conductor and removes the bonded dielectric, leaving the cable perfectly prepared and ready for the connector. A perfect prep means no signal loss and no down time.

FEATURES

- Bevels center conductor of cable
- Replaces pyramid cut
- Lifetime Warranty on Body
- Ergonomic and textured for ease of use

A Ben Hughes Communication Products Company

207 Middlesex Ave., P.O. Box 373
Chester, Connecticut 06412 USA
Phone: 800-394-4046
Int'l: (01) 860-526-4337
Fax: (01) 860-526-2291

CablePrep®
Tools You Trust.™



Pocket TerminX



Hex Crimp

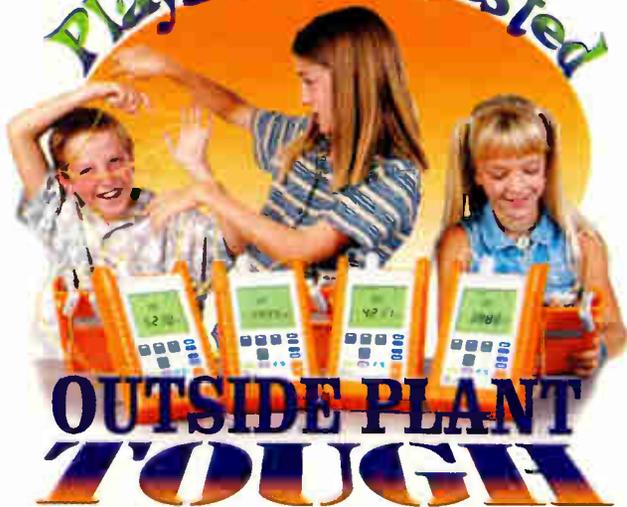


Armor Removal



Strip/Core

Playground Tested



OUTSIDE PLANT TOUGH

If RIFOCS 520 Series optical power meters and test sets can withstand the onslaught of 4th and 5th graders, think of how they will hold up to the rough and tumble of your outside-plant personnel.

- 522B Standard Power Meter
- 522B-HP High Power Meter (+27dBm max.)
- 523B-13/15 Standard SM Test Set
- 523B-13/15-HP High Power SM Test Set
- Multimode Test Sets coming soon



See us at:

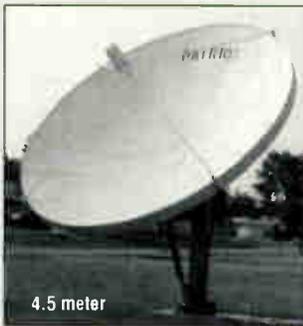
COTSCON WEST 2000, Dec. 12-13, San Diego, CA, Booth 40
OFC 2001, March 19-21, Anaheim, CA, Booth 1610

ISO 9001



RIFOCS Corp. INT+1-805-389-9800 • Fax. INT+1-805-389-9808 • sales@rifocs.com • www.rifocs.com

Satellite Antenna Systems



4.5 meter

- 1.8 meter
- 2.0 meter
- 2.4 meter
- 3.1 meter
- 3.8 meter
- 4.5 meter
- 6.1 meter

"Call us for all your satellite antenna requirements"

800-922-9200

www.megahz.com •
 engineering@megahz.com

MHz[®]
MEGA HERTZ
 Established 1975

distributes



"Unique" Products For the 21st Century!

Oregon, Arizona, Colorado, Texas, Missouri, Ohio, Pennsylvania, Georgia, Florida, New Hampshire

types of tuners, on-screen display graphics drivers, conditional access elements and other vendor-specific components. Also, the operating system must provide a robust event model and the facilities to handle the event-driven aspects and requirements of applications. These include display focus, inter-process messaging, timers, semaphores, memory management and the like.

The operating system must support important networking protocols such as TCP/IP, HTTP and SSL. HTTP is one of the foundations of the World Wide Web and the SSL has rapidly become the de facto Web protocol for securing communications between clients and servers.

Conclusion

Critical parts for portability support required for retail availability of host devices in cable systems are supplied by the OpenCable POD module and by open approaches using standard middleware. Combined with a robust operating system that abstracts details of platform hardware and provides system services to middleware and applications, the basic foundation of interoperability can be formed. The POD module supplies complete separation of conditional access functions from the host device and copy protection functions that are acceptable to the content industry. An open middleware approach provides additional standardization and abstraction for content rendering and the application execution environment.

Using this foundation, application developers can produce support for new services and be confident their efforts will be applicable to a wide range of host platforms. □

Anthony J. Wasilewski is chief scientist, software systems, subscriber networks sector, for Scientific-Atlanta, Inc. He can be reached at tony.wasilewski@sciatl.com.

Did this article help you? Let us know your thoughts. Send an e-mail to snayalkar@phillips.com.

What can you expect from Blonder Tongue Today?



Everything.

Broadband Headend Solutions to 860 MHz

Interdiction

Cable Modems

HFC Telephony

Fiber Optic/HFC Transport

Digital Broadband Communications



**BLONDER
TONGUE**
LABORATORIES, INC.

One Jake Brown Road, Old Bridge, NJ 08857

(732) 679-4000 • Fax (732) 679-4353

www.blondertongue.com

©2000 Blonder Tongue Laboratories, Inc. All Rights Reserved.

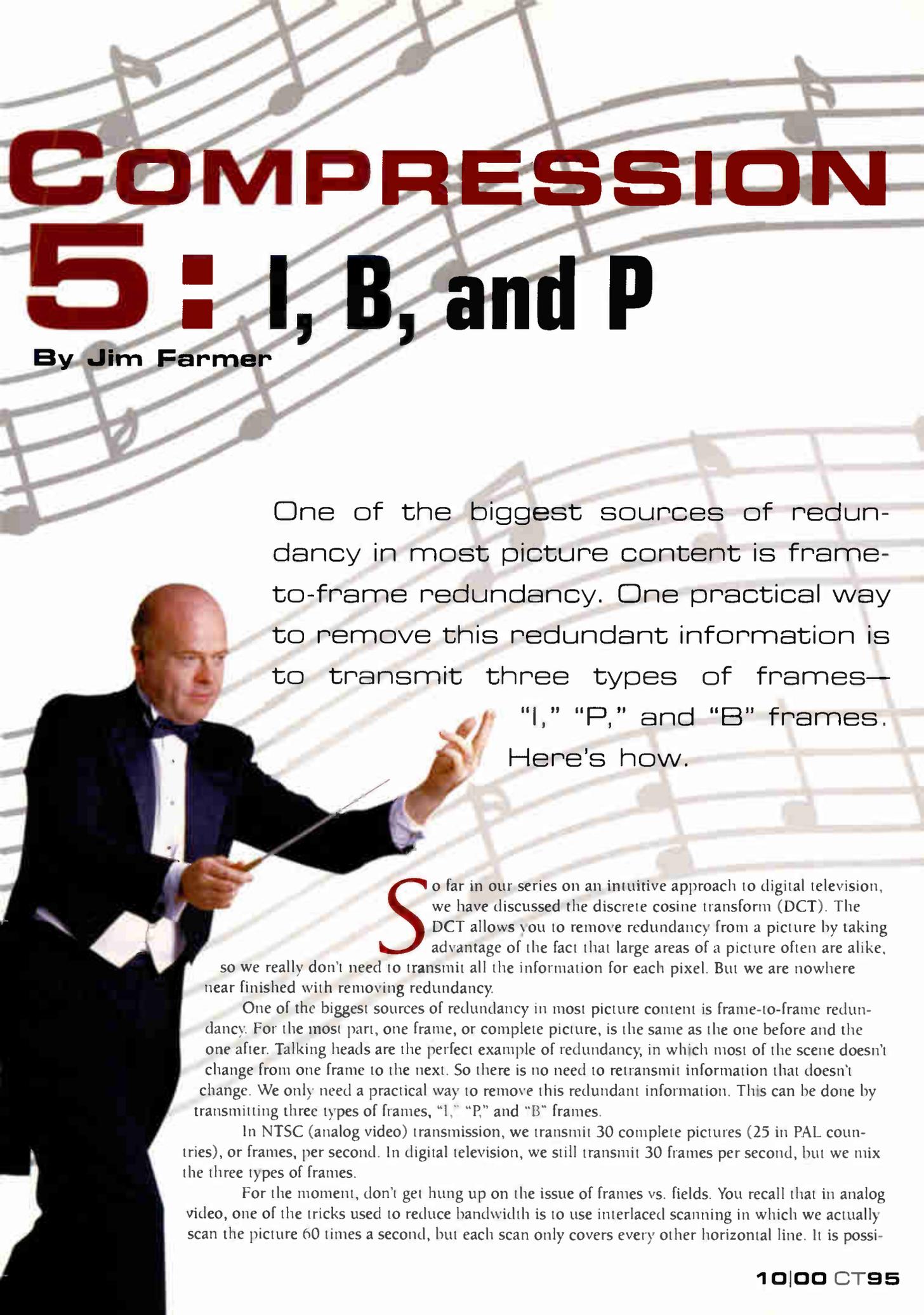
VIDEO



COMPRESSION

5: I, B, and P

By Jim Farmer



One of the biggest sources of redundancy in most picture content is frame-to-frame redundancy. One practical way to remove this redundant information is to transmit three types of frames—“I,” “P,” and “B” frames. Here's how.

So far in our series on an intuitive approach to digital television, we have discussed the discrete cosine transform (DCT). The DCT allows you to remove redundancy from a picture by taking advantage of the fact that large areas of a picture often are alike, so we really don't need to transmit all the information for each pixel. But we are nowhere near finished with removing redundancy.

One of the biggest sources of redundancy in most picture content is frame-to-frame redundancy. For the most part, one frame, or complete picture, is the same as the one before and the one after. Talking heads are the perfect example of redundancy, in which most of the scene doesn't change from one frame to the next. So there is no need to retransmit information that doesn't change. We only need a practical way to remove this redundant information. This can be done by transmitting three types of frames, “I,” “P,” and “B” frames.

In NTSC (analog video) transmission, we transmit 30 complete pictures (25 in PAL countries), or frames, per second. In digital television, we still transmit 30 frames per second, but we mix the three types of frames.

For the moment, don't get hung up on the issue of frames vs. fields. You recall that in analog video, one of the tricks used to reduce bandwidth is to use interlaced scanning in which we actually scan the picture 60 times a second, but each scan only covers every other horizontal line. It is possi-

ble to use interlaced scanning with digital television, or you can use progressive scanning, where we only scan the picture 30 times a second, but scan each line each time. We'll talk more about the differences later, but for now, to keep it simple, assume we are using progressive scanning, so that we don't have to worry about fields and frames. The DCT actually works better in this case.

I frames

The "I," or "interframe," is the fundamental picture. To generate I frames we perform the DCT, then stop (okay, there are more processing steps later, but we will come to them in time).

Every 8-by-8 pixel block is operated on by the DCT, and one by one these blocks are transferred to processing that we haven't yet discussed. Typically, an encoder might transmit two I frames each second. The I frame contains all the information needed to produce a picture, so when you first tune to a digital broadcast, the decoder must wait for an I frame before it has enough information to present a picture.

This is one reason why tuning from one digital channel to another takes longer than tuning from one analog NTSC channel to another: the receiver

FIGURE 1 P-FRAME ENCODING

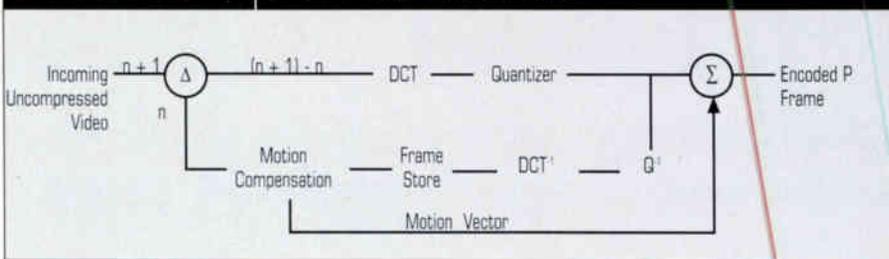
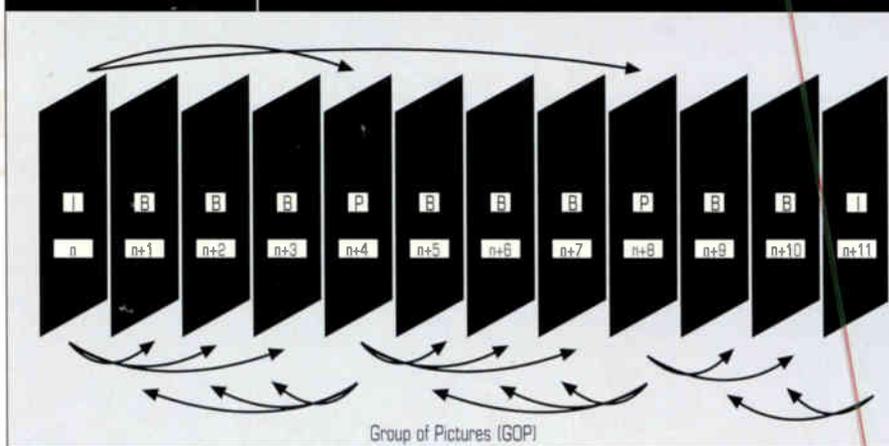


FIGURE 2 FRAME SEQUENCE IN A GOP



must first lock onto the clock (if tuning from one RF carrier to another), then it must wait around for an I frame before it can start presenting a picture. With only two I frames transmitted each second, this is up to a half second of waiting.

The encoder has to watch for scene changes. Since the new scene does not contain any information from the previous scene, the encoder must generate a new I frame every time the scene changes.

P frames

The next type of frame is called a "P," or "predicted" frame. To generate P frames, we compare one frame with a preceding frame, and only transmit the differences between the two. This works very well if there are large portions of the picture that don't change between scenes. Typically, you get a lot of compression from P frames—much more than with I frames and less than with B frames, which we discuss below.

Since we need to talk about predicting one frame from the previous frame, let's give names to several frames so that we can talk about

them. The first frame, we'll call n , or the n th frame. The very next frame we shall call the $n+1$ frame, and so on with the $n+2$ and subsequent frames.

We assume we know accurately what is in the n th frame. So when the $n+1$ frame is ready for processing, we will, on a pixel-by-pixel basis, subtract the n th frame from the $n+1$ frame. Where the two frames are identical, then we have 0 pixel value for every identical pixel in the two frames, and we can stop. It is only where there are differences between the two frames that we must transmit the information.

Figure 1 (above) shows how this works. Remember that we will operate on each pixel, or picture element, in the uncompressed frame, and we do this in 8-by-8 blocks of pixels. The n th frame is operated on by the DCT and quantizer (which, as you recall from last time, determines which bits (used to encode the DCT) are retained, and which are dropped in order to fit the signal into the bandwidth available).

The encoded n th field is supplied to further processing. It is also supplied to an inverse quantizer, Q^{-1} , and an inverse DCT, DCT^{-1} . The output of the

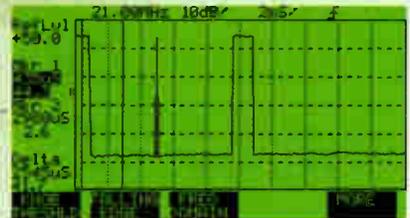
BOTTOMLINE

> Reducing Redundancy

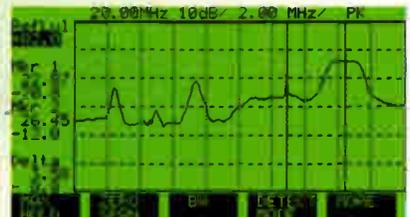
In digitizing a picture, we develop three types of frames, each operated on by the DCT. I frames contain all the information necessary to recreate one frame of the video. The problem is that it takes a lot of bits to make up an I frame, and we are not taking advantage for temporal (frame-to-frame) redundancy. We can get a lot more compression if we take advantage of temporal redundancy, by using P frames, which are predicted from a previous I frame, and B frames, which are predicted by using I and P frames before and after the B frame.

GET A **RETURN** ON YOUR DIGITAL TEST INVESTMENT

Digital QAM and Return Testing in One Instrument



Fast Zero Span Mode for accurate measurement of return path modem signals.

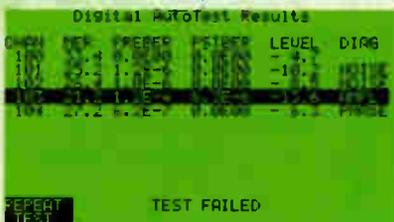


Fast, full function 5-860 MHz Spectrum Mode for tracking down ingress.

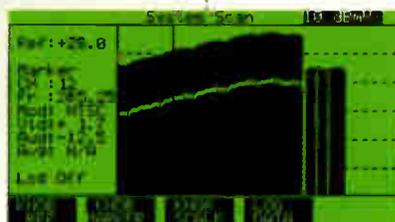


64 and 256 QAM Measurements with Hukk's exclusive Automatic Constellation Diagnosis*.

Introducing The New Hukk
CRI 200R Digital Signal Analyzer
 with return path testing



Auto Test automatically checks all of your digital channels and diagnoses any problems.



Full functioned Analog and Digital Signal Level Meter eliminates the need for a second instrument.



Accurate digital power reading over any bandwidth without correction factors.

EXCLUSIVE

- **44 MHz IF QAM Testing**
- **Automatic Constellation Diagnosis**

3250-D Peachtree Corners Circle
 Norcross GA 30092
 Phone: 888.236.8948
 770.446.6086
 Fax: 770.446.6850
www.hukk.com

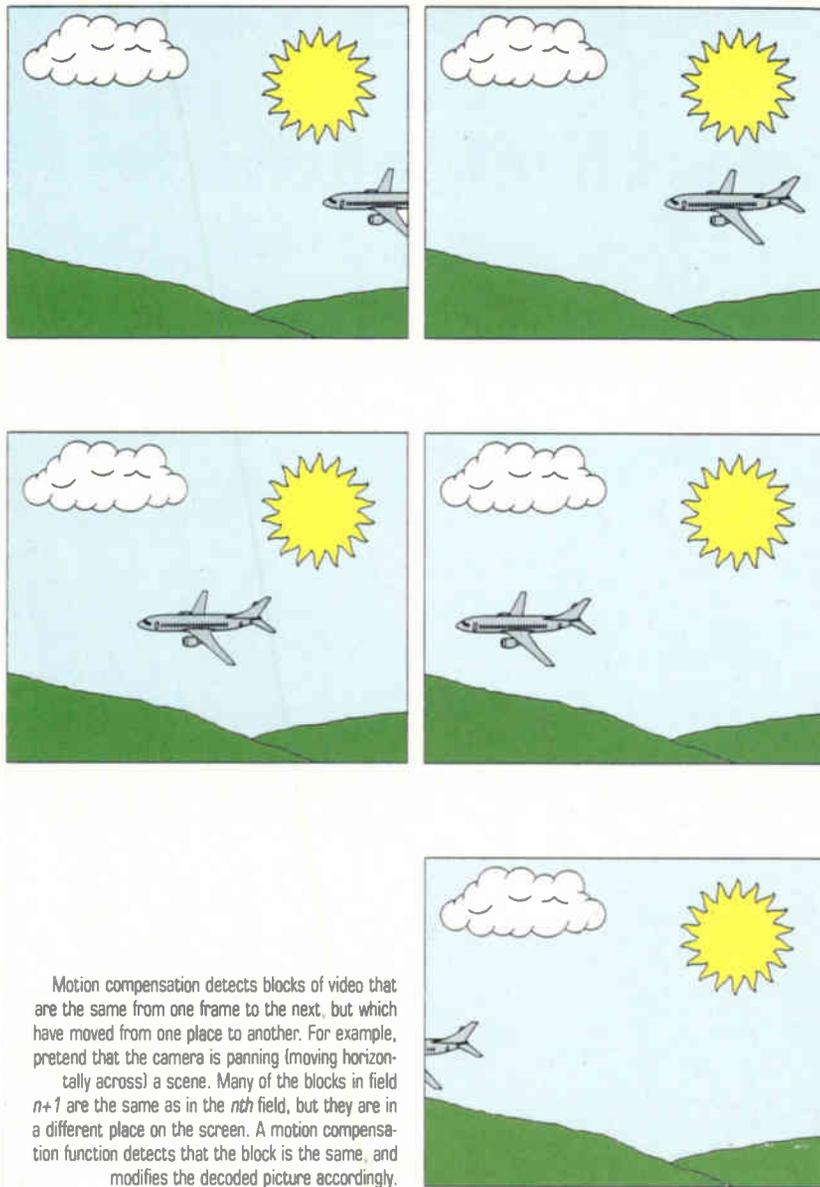


A Sunrise Telecom Company

*Patent pending

On-line seminars on digital and return path testing - www.hukk.com

FIGURE 3 MOTION COMPENSATION EXAMPLE



inverse DCT operation is the recovered n th field. This field is stored in the frame store, which keeps it until the $n+1$ field is ready for processing.

The subtractor, denoted by the Greek letter Delta (Δ), subtracts the value of each pixel in the $n+1$ field from the value of the corresponding pixel in the recovered n th field, presented to it from the frame store. To the extent that there has been no change in that pixel value, which will be the case for portions of the picture that didn't move, the result is 0, so there is nothing to encode. This can significantly reduce the number of

bits required to describe the picture.

Also shown is a motion compensation function. It detects blocks of video that are the same from one frame to the next, but which have moved from one place to another. For example, pretend that the camera is panning (moving horizontally across) a scene. Many of the blocks in field $n+1$ are the same as in the n th field, but they are in a different place on the screen. A motion compensation function detects that the block is the same, and modifies the decoded picture accordingly.

Of course, the information as to

what block moved where must be transmitted to the decoder, so we show a motion vector being added to the output of the process, at the circle marked with a Sigma (Σ). The identification of blocks that have moved is computationally quite intensive, so lower-cost encoders might compromise on this function. That doesn't mean they cannot produce good pictures, but it does mean that the bit rate may not be as low for the same picture quality.

The decoder does just the opposite. After recovering the n th frame, it is displayed, but is also held in memory for one frame, until the $n+1$ B frame is decoded. Then in order to display the $n+1$ frame, add the n th frame to the $n+1$ B frame (which contains the difference between the two). The result is the $n+1$ frame that you started with. Mathematically we could write this as:

$$n+1 = n + [(n+1) - n]$$

where the quantity in brackets represents the B frame as computed by the encoder. This bracketed quantity computation is shown in Figure 1 (page 96).

Recall that the DCT and the computations to derive the P frames are all done separately on the luminance signal and on two color difference signals. The block size used for the color difference signals is twice that used for the luminance signal, an acknowledgement that the human visual system is less sensitive to sharpness in colors than it is to sharpness in black and white.

Also, you can see from the above description that one of the things that can ruin a good encoding is to have any noise in the analog source material. If you have noise in the source material then on a frame-to-frame basis, even the exact same scene will not look the same to the encoder because noise, by definition, will change the luminance (and color difference) values from one frame to the next. This change will be interpreted as a different value, which is encoded to a non-zero value, so the DCT will have to handle it rather than just putting in a 0. >

The Moore Fiber Optic Underground Vault



**A Unique Storage
Design with
Moore Quality**

- High density polyethylene construction for corrosion resistance and sound design
- Lightweight design lowers installation costs and improves safety. Installs without the need for heavy lift equipment
- HDPE 200# concrete-filled lid option deters unauthorized entry
- Conventional cast iron manhole lids and rings are used for traffic installations
- Vaults are 48" in diameter and available in 3 nominal elevation(heights): 41", 53" & 65"

*The Leader In Construction Products
For Telecommunications Networks*

MOORE

MOORE DIVERSIFIED PRODUCTS, INC. • 1441 Sunshine Lane • Lexington, KY 40505-2918
800-769-1441 • 859-299-6653 fax • www.mooredp.com

This can drastically increase the number of bits required to transmit a given scene.

B frames

Now we come to some serious bit saving, with the use of B frames. B, or "between" frames, are composed of information from two other frames, one that comes before that

"B, or 'between' frames, are composed of information from two other frames, one that comes before that frame, and one that comes after."

frame, and one that comes after. Now this is going to seem a bit strange, but work with me for a mo-

ment. If I can predict one frame from the previous frame, I can also predict a frame from one following it.

You read that right. If the n th frame is an I frame, and the $n+9$ frame is an I frame, then I can "predict" the $n+2$ frame, the $n+3$ frame and several others in between, from the information in the two I frames. This is a backwards prediction requiring us to momentarily

suspend our usual concept of time. The way it really works, of course, is that we encode the n th and $n+9$ frames (in the example), and some of the in-between frames we hold in memory until we have those two processed.

After that, we go back and pick up the intervening frames,

and see how much information we can predict about them from looking at the n th and $n+9$ frames.

There are several things we can do with the n th and $n+9$ frames to allow computation of the frames that come in between. We can average the two frames, and this helps reduce the noise in the picture. We argued above that noise in the picture seriously crippled our ability to do a good job of encoding the picture, so this averaging, which reduces noise, helps reduce data rate. Also, we can do a better job of motion compensation if we know where a certain block of video will be in 9 frames. We can spot common blocks of video in the n th and $n+9$ frames, note their position, and interpolate to estimate where they will be in the intervening frames. We'll be close to right, so the difference information we must transmit for the intervening frames will be slight.

So there are several ways in which the B frame may be used: to reduce noise in the picture, or to make a better prediction of where blocks of video move. >

Proven Return Path Solution!



*Proven
Technology!*

*Patents
Pending*

High Performance Block Conversion For Return Path Bandwidth Expansion!

For over two years, Q-Stack™ Block Conversion Technology has been deployed and working, providing 4X Return Path Bandwidth Expansion allowing for advanced two-way services over Cable/HFC networks.

STACK™

Available for any node or OTN application.
DWDM compatible
>40 dB NPR

 **QINTECH™**
Electronics and Communications Inc.

(800)839-3658

1430 Rte. 286 Hwy E. • Indiana, PA 15701 • Fax: (724)349-1421 • <http://www.qecinc.com>

VOD

Demand More

e.merge is a fully integrated, customizable suite of back office applications specifically designed to support VOD, including:

Digital Media Management & Distribution
Subscriber Management
Targeted Broadband Ad Insertion

- Best of all, e.merge opens valuable new revenue streams for a faster return on investment.
- It is platform independent and interfaces with major STB's and video servers as well as interfacing with legacy systems.
- e.merge allows national authoring with "lights out" delivery to head ends and supports digital entertainment distribution, regardless of the pipe.
- e.merge from IMAKE is the comprehensive solution to manage all your VOD assets, studio obligations, and delivery of product, seamlessly from a single database.

e.merge™

THE POWER BEHIND DIGITAL ENTERTAINMENT



**Software and
Services Inc.**

a 24/7 Media Company

6700 Rockledge Drive
Suite 101A
Bethesda, MD 20817

301.896.9200 voice
www.imake.com
e-mail: emerge@imake.com

Both I and P frames can be used to compute B frames. (The term "anchor frame" is used to designate frames that can be used to compute B frames.) Figure 2 (page 96) shows the way the I, B, and P frames might be constructed. An I frame and the B and P frames following it are collectively known as a group of pictures, or GOP. As you see from Figure 2, each P

frame is predicted from an I frame that occurs perhaps several frames before that P frame. Then the I frame and the P frame are used to compute the B frames that come between the two. The number of B frames between I and P frames, and the number of P frames between I frames are not specified: the encoder can make decisions based on picture content and the

bandwidth available.

B frames contain the least number of bits and I frames contain the most number of bits, all else being equal. Thus, you can reduce the data rate by using more B frames per I frame (and per P frame). As you use more B and P frames, however, the picture prediction gets worse, so you wind up transmitting more correction information, and you reach the point of diminished returns.

Also, the more B and P frames, the longer it will take a TV just tuning to this broadcast, to start presenting a picture. Typically, you might find two I frames per second (but that is not a hard rule), if the scene is not changing too rapidly.

"An I frame and the B and P frames following it are collectively known as a group of pictures, or GOP."

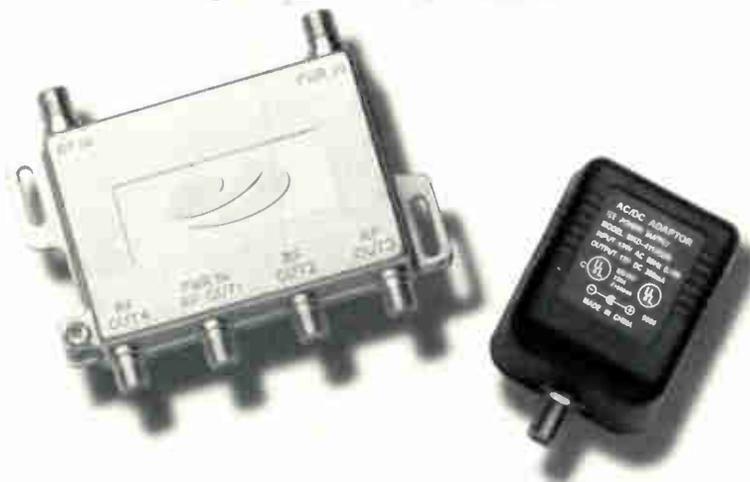
In order to make decoding as efficient as possible, we will transmit the frames used to compute the B frames, before we transmit the B frames. Thus, the order in which frames are transmitted is not the order in which they occur. You can see that there are a number of sources of delay in encoding the picture (and we have not found all the sources of delay yet). If we are going to use B frames we cannot encode all the frames until we have encoded the frames used in computing the B frames.

Next month we shall discuss other methods of data reduction in the digital video signal. Thanks to my good friend, Dr. Michael Isnardi of Sarnoff Labs, for helping me with some details that I was not clear on myself. □

Jim Farmer is chief technical officer of ANTEC, Inc. He can be reached at jo-farmer@mindspring.com.

Did this article help you? Let us know your thoughts. Send an e-mail to snayalkar@phillips.com.

TOO MANY CONNECTIONS & NOT ENOUGH SIGNAL?



Give your incoming signal a boost with the new RDA from Channell!

Too many TVs, cable modems and other in-home connections can be a real drag on your incoming signal. Channell's new, low cost 1GHz RDA (Residential Drop Amplifier) can solve the problem. It amplifies your signal, has low noise, a forward bandpass of 5+ - 1000 MHz and a passive reverse bandpass of 5 - +0 MHz. It also has excellent port-to-port isolation to prevent digital signal damage caused by microreflections. Dual powering options permit direct power input to the RDA, or remote powering by a power inserter. The innovative RDA from Channell RF Products Group. Just the kind of boost your signal needs.



CHANNELL

Where The Industry Connects

United States: 909-719-2600 • Canada: 905-565-1700
United Kingdom: 44-1689-871522 • Australia: 61-2-9738-8277 • Malaysia 60-3-6120-2055
<http://www.channellcomm.com>

You've got
to experience
the real thing



Others talk about Interactive TV. Only Canal+ Technologies truly delivers.
Our open standards-based solution enables what you want, when you want it.
Enhanced TV. The Internet. Personalized programming & services on demand.

The stuff to stimulate all your senses.

We've done it for more than 6 million viewers worldwide.

Come experience what we can do for you.

MAKING SENSE OUT OF INTERACTIVE TELEVISION

MEDIA GUARD

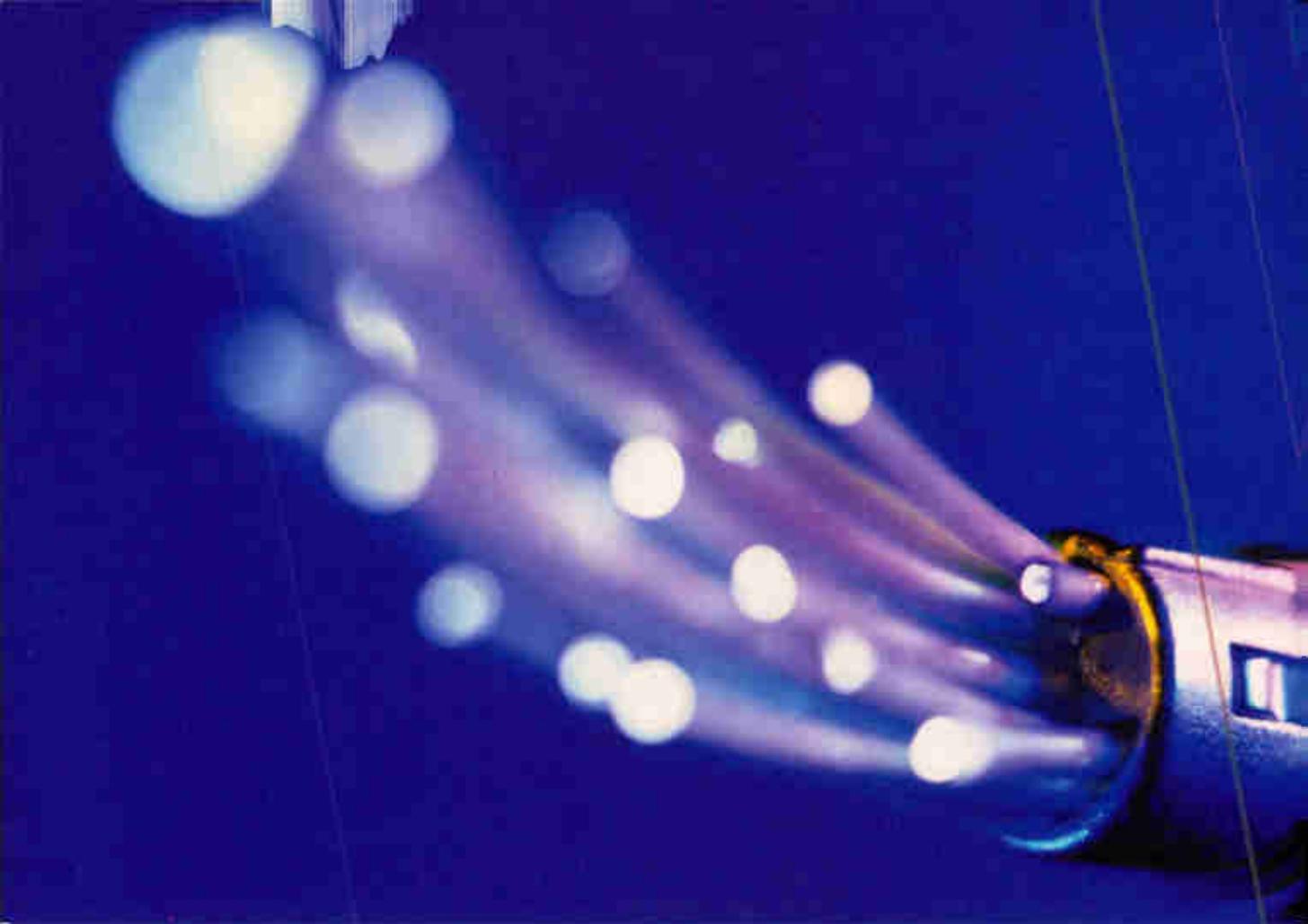
CANAL+

TECHNOLOGIES

MEDIA HIGHWAY

www.canalplus-technologies.com





The High Demand for **FIBER CABLE**

By Jonathan Tombes

While new networks are eating up the latest optical fiber, cable operators are having trouble finding the fiber they need. Economics is testing the strength of customer-supplier relations.

Smart minds are spurring optical fiber's long-haul transmission speeds to the 40 Gbps region and busy devising the next, best cabling technique. But economics is transforming this industry as much as technology. Unabated demand is making single-mode fiber look like a commodity. Make that a scarce commodity.

Dispersion slopes and other physical characteristics of the glass are no less

important than before. The key metric for many buyers today, however, is lead time. And how long is the wait?

"It varies," says Charlie Reavis, vice president of sales and marketing for **Lucent Technologies'** optical fiber solutions division. "But we have said, and as my friends at Corning have stated publicly, the industry is really sold out through the year 2001."

Alan Eusden, vice president and general manager of **Corning, Inc.'s** optical fiber division, sees continued shortage. "It does look like the supply of fiber will be very tight through the end of next year."

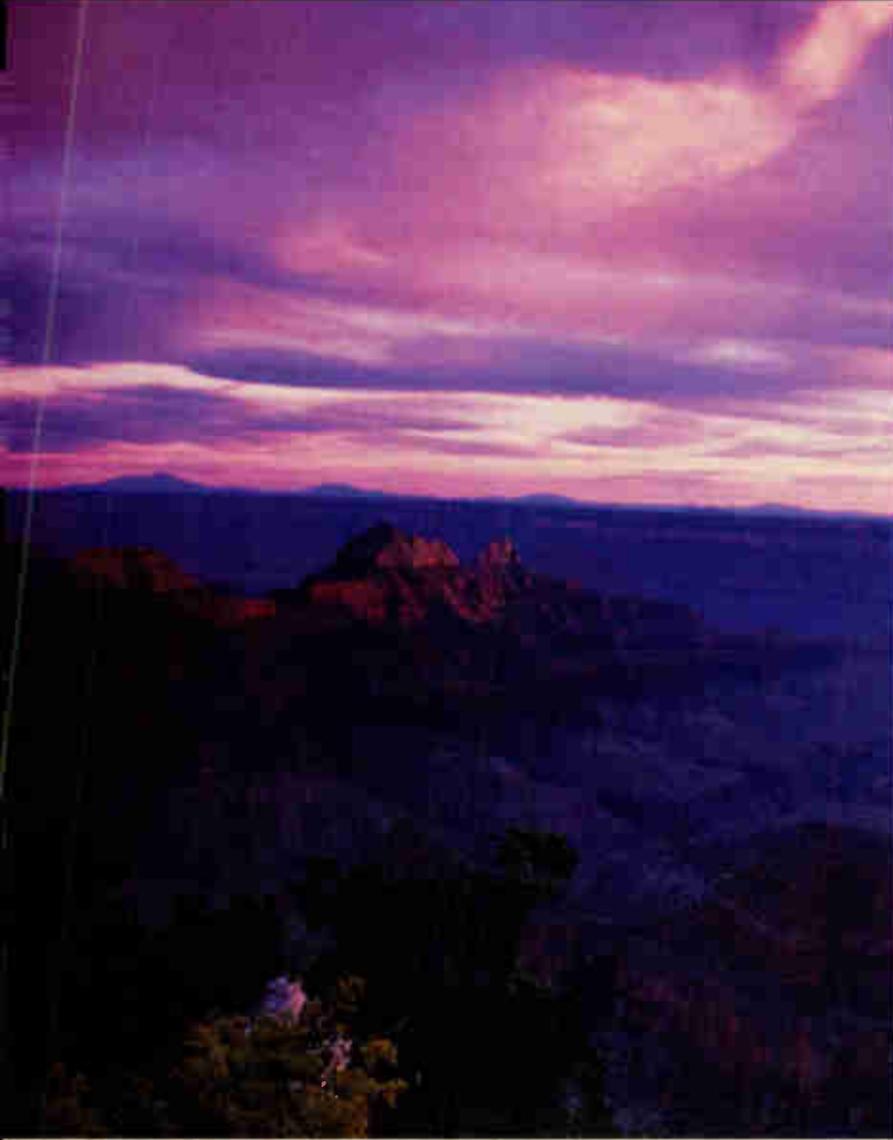
The same message comes from **Alcatel**. "Most of the fiber is committed through next year," says Todd Jennings, segment marketing manager for Alcatel's cable networks.

Thus the three major suppliers of optical-fiber cable to the U.S. cable TV industry agree: next year is pretty well booked.

More numbers

These trends are strong. According to fiber-optics market research firm **KMI**, U.S. demand for fiber-optic cable will

Sometimes, smaller is better.



Introducing the COYOTE[®] RUNT, the closure that goes where others can't. The COYOTE family of fiber optic closures is proud to present its newest member. Under 15" long and designed for node applications in low-count fiber distribution networks, the COYOTE RUNT Closure offers a compact, low-cost closure for use in most environments. It accepts two cables with up to two drops, holds two 12-count splice trays and has two studs for external grounding. To learn how the COYOTE RUNT (or other members of the COYOTE Pack) can answer your call of the wild, call us at (440)461-5200, or visit our Web site at www.preformed.com or e-mail us at inquiries@preformed.com.

PREFORMED LINE PRODUCTS

COYOTE[®]



RUNT

CLOSURE

Goes wherever
fiber optic cable takes you[™]



© 1999 Preformed Line Products.
All rights reserved.

total 34 million fiber kilometers this year. Projected demand by 2002 will double to 66 million, or five times the level of 1997. (See Figure 1, page 108.)

Cable TV's consumption of glass approaches 20 percent of the total. KMI estimates the industry's demand this year at 5.5 million fiber km, and sees that rising to 12.7 million in 2002.

Globally, KMI sees total demand reaching 154 million fiber km by 2002. Demand in Asia-Pacific alone is expected to increase from 30 million to 46 million over the next two years.

Manufacturers are responding with a massive shift of resources. KMI estimates an astonishing five-fold increase in capacity investment this year over last. (See Figure 2, page 110.) And note as well: one-third of that investment is happening in companies "other" than Corning, Lucent and Alcatel.

Who are the "others"? Apart from the big three, KMI's capacity estimates include groups from Japan (**Fujikura**, **Furukawa**, **Hitachi** and **Sumitomo**), Holland (**Draka**), Italy (**Pirelli**) and Korea (numerous manufacturers).

Newport, N.Y.-based market research firm **World Information Technologies** puts Pirelli in a fourth place tie with Belden among suppliers of fiber-optic cable to the U.S. cable TV market. So an already internationalized market is becoming even more so.

Buyer beware?

You don't have to read market research to know that if you want fiber today you have to look abroad. "That's the only way to find it," says Charles Alfonso, vice president of purchasing for **Digital Access**, an overbuilder working in four U.S. markets. Alfonso recently secured fiber from Korea.

Even operators without the overbuilder's high-fiber appetite are seeking new sources. Hugh McCarley, vice president of engineering for **Cox Communications**, says that he has Korean fiber in trials and also is looking at offerings in India and South Africa. Steve Gines, vice president of purchasing for **Time Warner Cable**, says he has bought fiber on

the spot market from a Turkish manufacturer.

Gines used **Jones Broadband** as his broker for the deal with the Turkish manufacturer, **Hefibel**. The matchmaker for Alfonso was Philadelphia-based Kwan Kim, president of **Intercon Enterprises**.

"This guy came to me when I was at **Comcast** with imported remote controls," says Alfonso. "Later, he asked me what operators would be wanting. I saw fiber prices escalating and shipments being missed and told him so."

Kim produced impressive samples and specs. "Korean fiber is at the standard of Corning, or higher," says Alfonso. While several Korean manufacturers have entered this market, Alfonso and McCarley both referred to the **LG Group** (formerly, Lucky Goldstar).

Considering himself lucky with both broker and product, Alfonso nonetheless cautions others. "In situations of extreme shortage, it's 'buyer beware,'" he says.

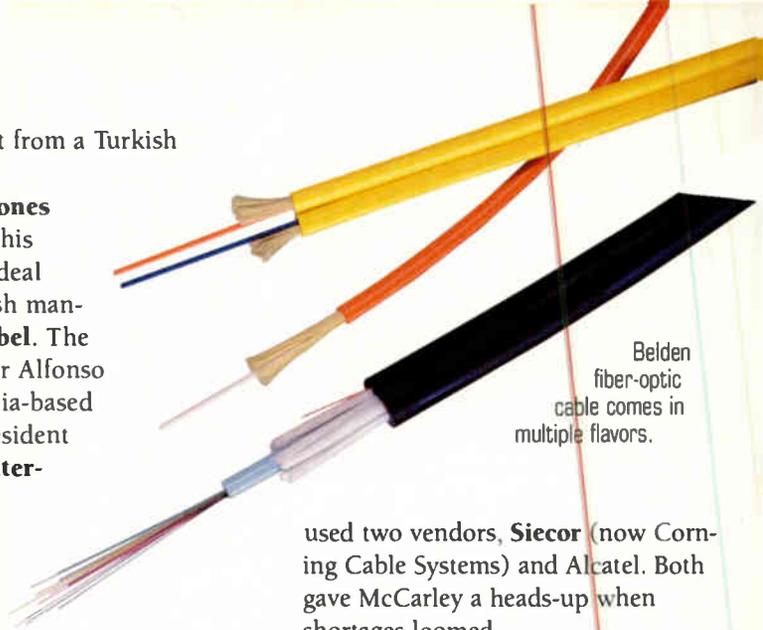
Ron Boyer, Time Warner Cable's senior staff engineer, agrees. He has done in-field splicing and loss measurements on the Turkish product and as a "friendship deal" got access to some of Corning's labs for testing.

"People need to look out for not only losses and continuity over the initial install, but how does she age over a period of time," says Boyer. Unfortunately, he adds, MSOs generally don't have accelerated aging chambers.

"The warranty [on international spot buys] is about over when you drop it on the shore of our country," he says.

Diversify

Multi-sourcing is also happening domestically. McCarley says that up until the recent crunch, Cox mainly



Belden fiber-optic cable comes in multiple flavors.

used two vendors, **Siecor** (now Corning Cable Systems) and Alcatel. Both gave McCarley a heads-up when shortages loomed.

That gave Cox time to find additional sources. Apart from the limited use of LG fiber, Cox is now buying from **CommScope** and **Superior Essex**.

McCarley says Cox has made other adjustments: accepting standard instead of customized fiber counts, for instance; and ordering prior to knowing the exact needs of its individual systems, and then allocating on a monthly basis.

Time Warner Cable has a similar story. Gines says that "Corning fulfilled and even exceeded its commitments." But CommScope has become a "major supplier," and **Telewire**, an **Antec**-owned distributor that gets fiber from Alcatel, also has stepped in.

It's not entirely clear whether all operators are scrambling. A spokesperson for **AT&T Broadband**, for example, said the MSO had experienced no problems getting fiber. But the evidence of market constraint is compelling.

What's less clear is how this predicament arose. Wasn't there enough fiber to go around only two years ago?

Premium fibers

"The price of glass in 1993 was around 9 cents a fiber meter," says John Valentine, vice president of fiber-optic operations for **Belden**. "If you track this, it dropped to around 3 cents a fiber meter around 18 months ago, when there was a glut of capacity."

What happened next? Corning's Eusden lists several reasons for the

Innovation At All The

Right Times.



Times Fiber Communications, Inc.

A Division of Amphenol Corporation

358 Hall Avenue • P.O. Box 384 • Wallingford, CT 06492
(203) 265-8500 1-800-677-2288 FAX (203) 265-8422
www.timesfiber.com

> Need fiber?

If you haven't yet placed your order, don't expect delivery any time soon. The major suppliers to the U.S. cable market say that 2001 is pretty well booked up.

Try looking abroad. Some buyers have obtained fiber from Korea and Turkey. Others are looking at India and South Africa. But when you venture too far off the beaten path, beware. "There are a lot of shysters out there—when all they're doing is canvassing for paper," warns one savvy buyer.

Ramped-up production of high-end, non-zero dispersion shifted fibers for new network builders has displaced some of the standard single-mode fiber that most MSOs require. Find out what your suppliers can and cannot do for you. It's in everyone's interest that they live up to their commitments.

surprising turnaround: phenomenal growth in bandwidth demand, availability of capital for new network builds, and network providers willing to take that capital and build.

Eusden also points to himself. "I think that many of the fiber makers, Lucent and Corning in particular, helped to drive the demand situation with the introduction and the success of the premium products, products like LEAF (large effective area fiber) and MetroCor for us," he says.

These products are largely dispersion-shifted (DS) fibers. Whereas standard fiber exhibits zero chromatic dispersion near 1310 nanometers, fiber doping and additional cladding enabled a shift of that null point to the 1550 nm range, lower attenuation being a major payoff.

But a problem, "four-wave mixing," arose when more than two wavelengths were sent over this first generation of dispersion-shifted fiber, says KMI analyst Patrick Fay. "In order to get around that hurdle, both Lucent and Corning came up

with a non-zero dispersion-shifted fiber (NZDS) that shifted the zero dispersion point out of the 1550 nm window to, say, 1565 nm or 1535 nm or 1540 nm."

Long-haul fibers

Corning launched LEAF in 1998, and this past August released a third-generation product aimed at the highest transmission distance and data rates, that is, the emerging 40 Gbps transport systems. Lucent launched its first NZDS fiber, TrueWave, in 1994.

Two years ago, it debuted TrueWave RS (reduced slope), offering better dispersion performance and also targeted for long-distance providers.

Alcatel and Pirelli have similarly targeted NZDS fibers, TeraLight and FreeLight, respectively. None is really aimed at the cable TV market.

North American customers of Corning's LEAF include **Level 3, Williams, Broadwing, Aerie Networks, Touch America and 360networks**. Among those purchasing Lucent's TrueWave are **Qwest, Global Crossing, Enron, PEnet, and Metromedia Fiber Network**. Not the usual MSO suspects.

Time Warner's Ron Boyer spells out the distinct end-user require-

ments. Studying this technology earlier this year, he found that to make NZDS work you needed point-to-point connectivity of 100 miles or more. "(But) if you look at a metro design similar to what a cable system would build, very seldom do you see 100 miles of pure glass stretched from one place to another."

Higher prices were another impediment. At the start of the year, he found that NZDS fiber cost twice as much as conventional single mode.

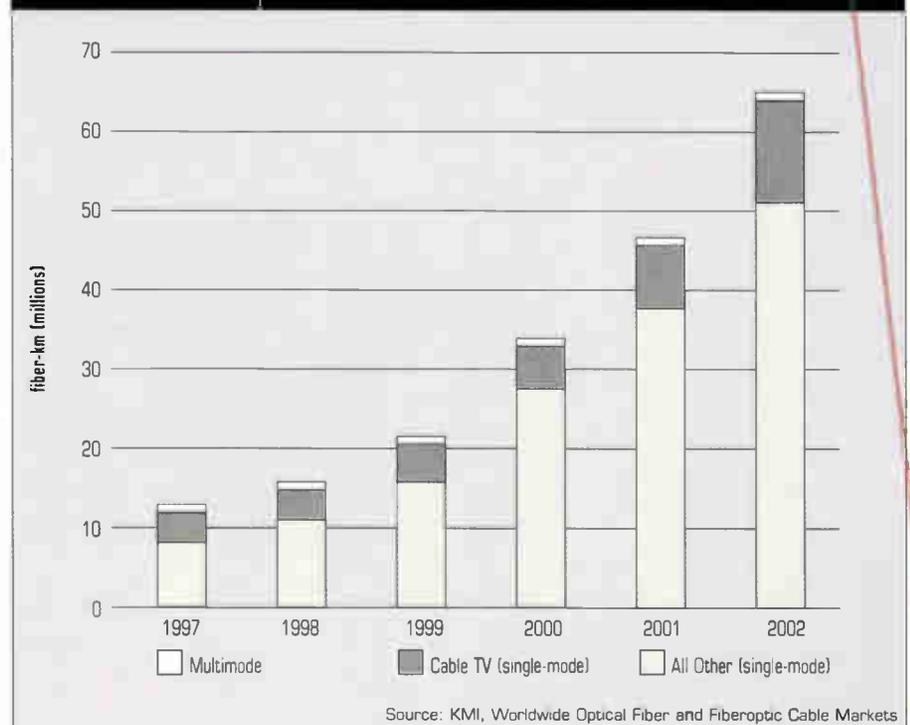
AllWave and MetroCor

Along with TrueWave RS, in 1998 Lucent also introduced AllWave, a conventional single mode fiber that reduced the so-called "water peak" in the 1400 nm wavelength range, thus tapping a previously unusable space in the fiber spectrum.

In March this year, Corning responded with MetroCor, an NZDS fiber also designed to operate across the full (1280 nm to 1625 nm) spectrum.

From the start, Lucent emphasized potential cable TV applications of AllWave, noting the interest of vendors such as **Scientific-Atlanta** and (then) **General Instrument**. Others are investigating the potential. >

FIGURE 1 U.S. CABLED FIBER DEMAND, 1997-2002



How many is *a kajillion?*



*Sprint North Supply brings you the
largest supply of 3M products in stock.*

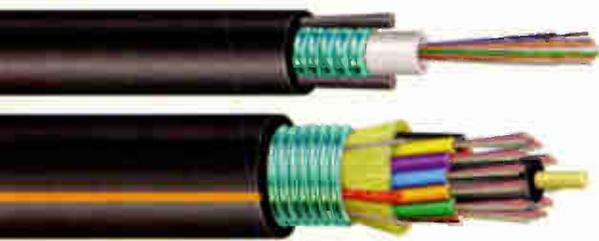
What you want...when you want it!

Call us today at 1-800-755-3004
www.sprintnorthsupply.com

Visit us at Outside Plant 2000 Expo—Booth 919

There must be a kajillion different 3M products. So, where can you find what you need—fast? **Sprint North Supply!** Our humongous warehouses stock more 3M products than any other distributor. And we've researched and tested the most powerful products in the Outside Plant market. In fact, we are pleased to offer 3M products in our ClearCapacity™ product line. Call Sprint North Supply for all your 3M products and scratch a kajillion things off your list of a bazillion and one things to do today.





CommScope's Fiber Feeder Family (above left) and standard loose tube cable (below left) are two distinct cable solutions.

Differentiation

The reason is that opportunities for differentiation remain. This is the case for both the fiber and the sheathing, or cabling, that surrounds it.

Whether it's Lucent's modified chemical vapor deposition (MCVD) or Alcatel's advanced plasma and vapor deposition (AP&VD), techniques for manufacturing the fiber remain proprietary.

Alcatel likewise emphasizes its fiber's high geometrical precision, which happens to be something that cable manufacturer CommScope says it requires in order to market its product as "very fusion-splice friendly." Alcatel also uses a trademarked ColorLock coloring process in its fiber coatings.

Cable manufacturers such as CommScope and Belden also rely on differentiation when it comes to bundling and deploying fiber.

CommScope's Fiber Feeder Family, for instance, a variously configured 4-millimeter tube that can handle up to 24 fibers, is a design that marketing director Beni Blell says arose from working closely with customers. It is used in the secondary loop or ring, as well as in distribution channels in a hybrid fiber/coax (HFC) network. >

Mike Kelly, C-COR.net's vice president of sales engineering, remains intrigued by the implications for coarse wavelength division multiplexing. He describes AllWave as an "advance in fiber technology that is going to cause an advance in electronics."

Lucent's Charlie Reavis says that AllWave's two-way capability is another benefit for the cable industry. "If you take advantage of AllWave, then you can literally do that transmission on one fiber."

Corning's MetroCor is optimized for the 1550 nm region associated with dense wavelength division multiplexing (DWDM) and for distances in the 100 km to 200 km range. Its cable TV applications include system interconnects.

As DWDM becomes more prevalent in cable TV architectures, opportunities for using MetroCor may likewise increase. But no fiber works apart from transmission equipment.

Boyer says fibers that offer more usable spectrum sound good—on paper. "But guess what," he adds. "Nobody builds the electronics to do it."

"So, great, I've got extra bandwidth," Boyer says. "Too bad I can't use it. Still, it's like the chicken and the egg—we sort of got the chicken ahead of the egg on this one."

Commodity market

Few can complain about the explosion in bandwidth demand, which caught the fiber manufacturers off guard. But not everyone is pleased with the heightened role of premium fibers in these vendors' product mixes.

"There's been some rumbling especially among cable TV operators, who were caught in a pinch in the last year and probably this year also, because Corning and Lucent were devoting more of their resources to producing this LEAF or NZDS fiber," says KMI's Fay. "(They) weren't producing the SMF 28 (Corning's nomenclature for single mode fiber) that these guys

were used to using."

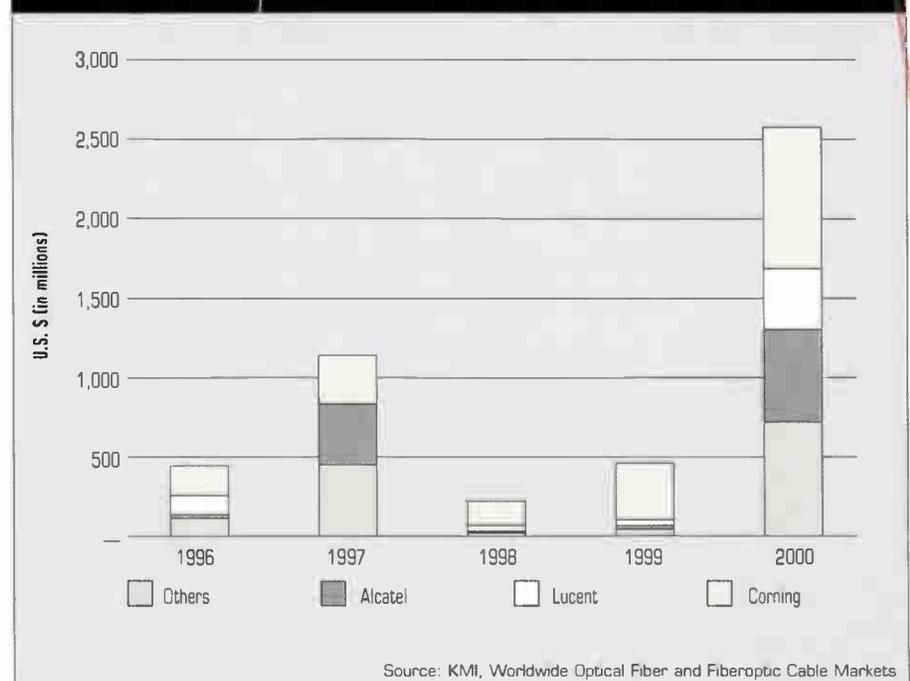
In defense, Corning's Eusden says that more than half of Corning's capacity is devoted to standard single mode product. "We see standard single mode product as being a fiber that will be around for the long-term, it's just an absolute workhorse product," he says.

"We'll still keep on encouraging people to understand the value proposition of the other fibers... but don't ever think that we're not committed to continuing to invest in standard single mode production."

Meanwhile, standard single mode is beginning to look like a commodity. There's an international spot market and, according to Belden's Valentine, quarterly pricing. "Everyone builds it. The specs are pretty universal," Boyer says.

"If you want to buy copper, you go to the Comex," says Belden's Valentine. "There is no Comex per se for glass." Why is that?

FIGURE 2 ANNOUNCED AND ESTIMATED INVESTMENT IN FIBER CAPACITY, 1996-2000



HFC



COAX

FIBER



IF YOUR DIRECTION IS COAX OR FIBER CABLE, COMMSCOPE WILL TAKE YOU THERE. (800)982-1708 OR
WWW.COMMSCOPE.COM

**CABLE
INNOVATIONS®**
LOOKING TO THE FUTURE

From the headend
to the drop....

Cable Innovations' SURGE SUPPRESSORS

Superior Reliability
Superior Durability
Superior Customer Support

800-952-5146

Cable Innovations Inc.
130 Stanley Ct.
Lawrenceville, GA 30045

www.cableinnovations.com

Valentine underscores Belden's leadership role in such things as dry-block technology, and its ability to handle copper and glass on a customized basis. Belden worked with NBC, for instance, to deploy cable at 39 venues at this year's Olympics in Australia.

CommScope's Blell also believes that understanding fiber and copper gives his firm an advantage as fiber is taken deeper into HFC networks. "These transitions don't happen overnight; we are well-equipped to understand operators."

Even on the cable side, however, the bottom line veers toward a standard product. "The stranded loose tube family is still by far the most popular industry construction," Blell says.

In CommScope's stranded loose tube, fiber is laid by reverse oscillation (six in one direction, six in another) around a glass-reinforced plastic rod that is itself wrapped in aramid yarn (aka **Dupont's Kevlar**) and tape impregnated with super absorbent polymers. The tube can then be armored with corrugated steel and jacketed with polyethylene.

"We are probably 98 percent or 99 percent loose tube," says Cox's McCarley. "Loose tube provides the most flexibility for configuration in the field," says Time Warner's Boyer. "Armored is also the creature of choice."

Relationship issues

That a standard type of fiber-optic cable exists is not to say that innovation has ceased. Alcatel, for instance, has devised its lighter weight Flextube alternative. And it's not the only one pushing the envelope.

"We're constantly looking at how we can package more fibers into a smaller sheath or a smaller outside diameter package," says Lucent's Reavis. Cable TV may not need cables packed with upward of 1,000 fibers, but as with technologies such as DWDM, the industry benefits when such advances migrate from the long-haul into metro and access space.

The shortage of standard single mode fiber, however, is as much a force in this industry as technological advance. "Customer-supplier relationships are up for grabs," says KMI's Fay.

The smart vendors get it. "Just because most of the volume is committed doesn't mean that we're sitting back on our laurels," says Natalie Verres, marketing and communications director for Alcatel's cable systems.

"At some point in time, this really fun ride is going to end, and the supply is going to be greater than the demand," she continues. "In that case, customers remember what you did and didn't do for them when things were tough for them." **CT**

Jonathan Tombes is deployment editor for Communications Technology. He can be reached at jtombes@phillips.com.

Did this article help your business? Let us know your thoughts. Send an e-mail to snayalkar@phillips.com.



Pico Macom, Inc.



Announcing new additions
to the CATV community

The **Pico Pro** line
of headend components



Combine unsurpassed quality, reliability, and low cost of the Pico Pro line of headend components with expert customer service for a winning combination

Now with 5-year limited warranty

Pico Macom, Inc. 12500 Foothill Blvd., Lakeview Terrace, CA 91342
(800) 421-6511 (818) 897-0028 • fax (818) 834-7197
www.piconet.com



Industry

Thanks to cheaper equipment costs and technology advances, fiber-to-the-home is beginning to become a viable option, telcos say. This could have implications for the future of copper.

Vendors as well as incumbent and competitive local exchange carriers (ILECs and CLECs) are making noise again about the reality of fiber-to-the-home (FTTH). In the past, this has not led to much action. Will this time be any different?

Some industry members say yes, given the technological advances, the competitive race to provide bundled services to customers and the dropping cost of equipment.

MSOs are selling cable-modem service, but they also are beginning to take away telephony customers, which are still the bread and butter of regional Bell operating companies (RBOCs), says John Gibbs, director of marketing for **Marconi's** inside access group.



Fiber-to-the-Home Becomes Reality

By Monta Monaco Hennon

"The one who can deliver multiple services over one architecture can charge a lower price. The question is who is going to win," Gibbs says. "Unless the RBOCs do something to upgrade their networks and provide a true bundled package, they'll see their traditional revenue stream disappear."

The CLECs, on the other hand, know they can put competitive pressure on the incumbents by rushing to offer first multiple services over one pipe.

"If you are in the CLECs' position and want to compete with somebody, it will be difficult to compete by coming in with a twisted pair plant," says Joe Dooley, director of product management for **Optical Solutions**.

Western Integrated Networks is one such overbuilder that agrees with

Dooley's sentiment. The company is working on FTTH in the areas it already has been awarded franchises. Its system in Sacramento, Calif., is slated for completion by February 2001.

"The competitive advantage is clear. Shared bandwidth is always going to impose some limitations. The only way to avoid the limitations is to take fiber right to the home," says Bill Mahon, senior vice president at Western.

Dooley echoes Gibbs' feeling that RBOCs will be forced to address FTTH, especially where they are already planning network upgrades.

"If you are an ILEC in rebuild, and put in fiber-to-the-home, it is a barrier to entry to competitors. Whether you are in a proactive aggressive position or a defensive position, FTTH is a way

to ensure you have a competitive advantage," Dooley says.

FTTH means RBOCs will face non-traditional competitors as well, Dooley adds. Developers are realizing that if they can build a "smart community," they can not only raise the prices of the homes, but they also can pull in residual revenue through the ownership of the infrastructure, he explains. At the same time, electric utilities are seeing FTTH as a way to utilize their rights of way.

As a result, Dooley says, even the RBOCs slowly are revealing tangible plans for roll out.

For example, **Verizon Communications**, of which **Bell Atlantic** is now a part, recently announced it was testing Marconi's Deep Fiber FTTH solution

and is planning for a "practice run." Later this year, the company hopes to roll out the product to a "couple hundred" homes for so-called field verification in an as-of-yet undisclosed location on the eastern seaboard.

"We will ramp up in the hundreds the first year, thousands the second year, then tens of thousands and hun-

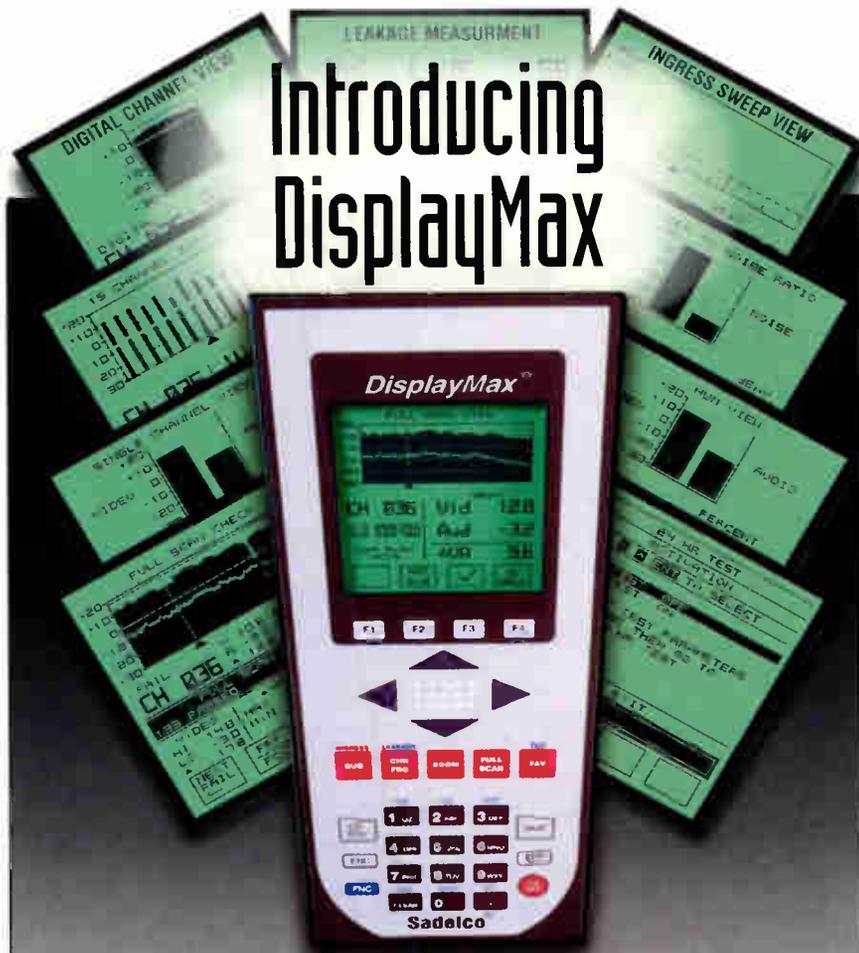
dreds of thousands and so on. That is what you do as an RBOC," says Rick Hofman, director of transmission and future technologies for Verizon.

Equipment Changes

It doesn't hurt that at the same time competition is heating up, the cost of equipment is falling.

"There are now lower-cost, higher-performance systems for bringing voice and data into the home over the same piece of fiber.... The components are now five to 10 times less expensive than previously," says Jeffrey Rittcher, general manager of **Lucent Technology's** optical access products division.

U.S. CLEC **CoreComm's** European sister, NTL Group Ltd., already has 3,300 customers in Stockholm receiving high-speed data service via an FTTH architecture and plans to offer a similar service in London within the



Introducing DisplayMax

Superior accuracy combined with easy operation make DisplayMax the ideal meter for both advanced technicians and new installers. From basic signal level reading to sophisticated ingress analysis, DisplayMax provides all the tests you need.

Call today for complete DisplayMax specifications.

1-800-569-6299

The Only Thing Missing is the High Price

Sadelco®

Outstanding Value Since 1960

Worldwide Call 1-201-569-3323 • fax 201-569-6285 • Sadelco, Inc. • 75 W. Forest Ave. • Englewood, NJ 07631 • USA
<http://www.sadelco.com> • e-mail: sadelco@aol.com

BOTTOM LINE

> FTTH Makes Inroads

The telco industry says progress is being made on the fiber-to-the-home (FTTH) front. Prices for equipment are dropping and technological advances are making it economically comparable to copper, especially on new builds or in areas where upgrades were needed anyway.

CLECs are beginning with multitenant dwellings, but say they have plans to bring FTTH to single family homes as well. RBOCs too are rolling out the technology, and say upgrades to FTTH will become part of their yearly network budget.

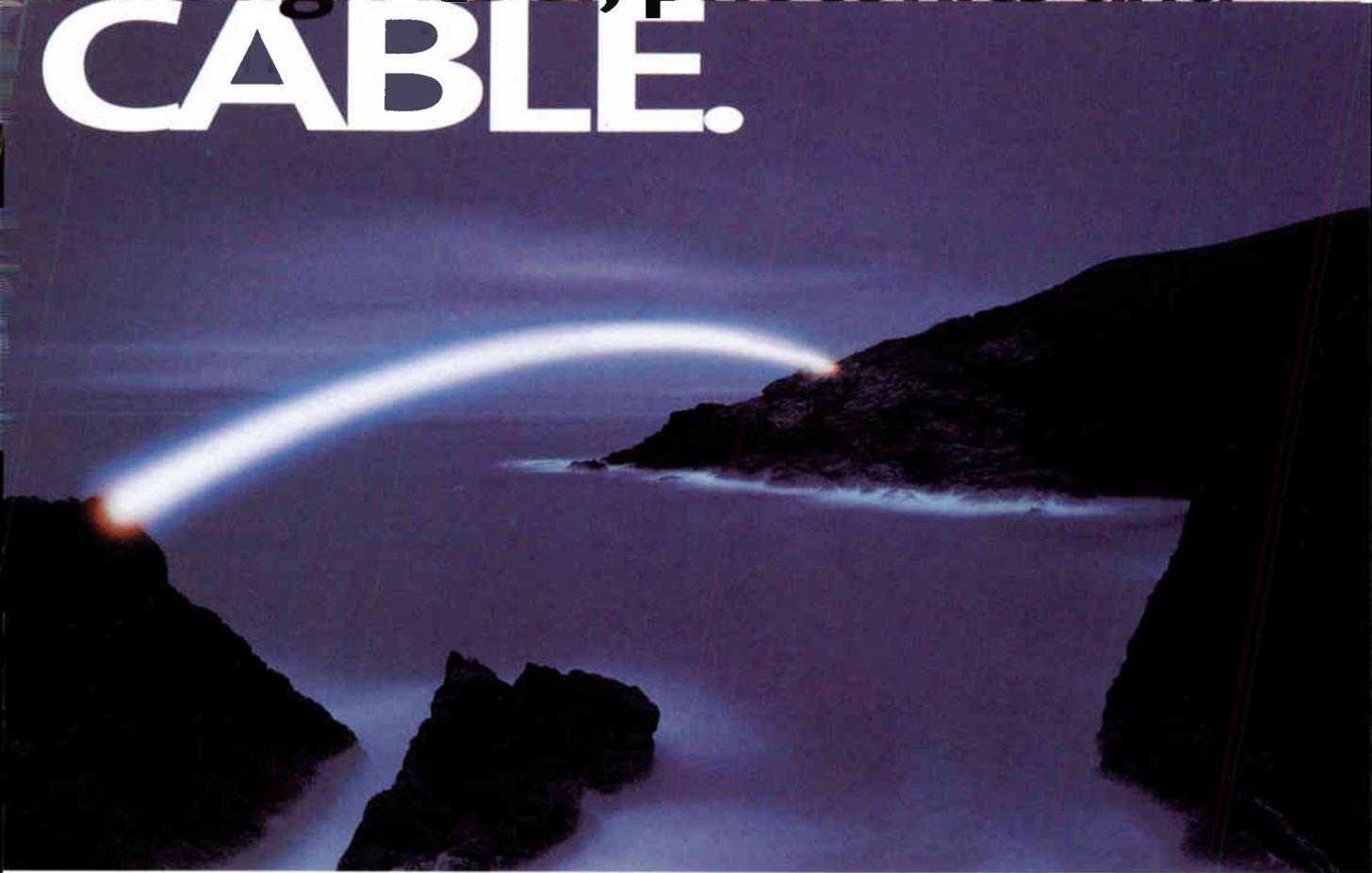
Some say the reason is increasing competition and the race to provide multiple services, including broadband, over one pipe. The RBOCs, for example, finally will take action because they do not want to lose telephony customers to MSOs or CLECs. They need the advanced technology to compete.

However, some still say FTTH still is hype, at least when it would involve retrofitting major cities or older developments, because the cost still is too high and demand too low. They add, though, that it is becoming more of a reality for greenfield builds and multitenant dwellings.



CORNING
Discovering Beyond Imagination

Connecting the world through fiber, photonics and **CABLE.**



Siecor is now Corning Cable Systems.

The world's largest manufacturer of cable and hardware solutions for network system applications is now a member of the Corning family. And while our name has changed, our commitment to providing exceptional product quality and customer service has not. In fact, the connection has made us even stronger.

www.corning.com/cablesystems
1-800-743-2671 (Toll-free)
+1-828-327-5000 (International)

© 2000, Corning Incorporated

next six months. CoreComm recently announced its intent to deliver FTTH in the United States as well, and has set the wheel in motion by forming a new subsidiary, CoreComm Fiber Co. The only details Blumenthal would give about CoreComm's U.S. plans are that his company has the capacity for a nationwide network, will selectively

build FTTH where "we think the economics are appropriate," will work with **Corning Inc.** on the project and will launch FTTH in the United States sometime next year.

"The reason we are prepared to do it in the United States in addition to Europe is the cost of the equipment and the system is dropping so rapidly. The

price is dropping about 40 percent compounded annually," says George Blumenthal, CoreComm chairman.

Verizon's Hofman agrees.

"About a year ago, we really had a breakthrough in the construction of fiber cable. Fiber-splicing machines have really matured.... Now we can build fiber as cheaply as we can build copper. It is really robust and idiot-proof enough that we can do it like copper. The time is right."

It doesn't hurt that Marconi committed to working with Verizon on an FTTH option that met its outside plant requirements. The company needed a design where one fiber splits off to four houses. Wave division multiplexing brings a level of scalability to the table.

"A company can add more and more wavelengths and more services—even those we don't know about today," Marconi's Gibbs says.

Marconi and other vendors have taken advantage of other technological breakthroughs as well. The device that sits outside the home converts optical signals so the end user does not need to purchase new equipment, but rather can use an existing set-top box, for example.

In addition, the concept of a passive optical network (PON) means there are no power boxes in the field between the central office and subscriber premises. According to Dooley, this means less operating expense and a more reliable plant for the longer term.

"Part of the PON concept is that as new services are demanded, you can upgrade the electronics at the customer premise and provide new services as the customer is willing to pay, but you only have to upgrade consumers who want to pay for the services. Companies are not compelled to upgrade entire neighborhoods at the same time," he explains.

"The light just goes down the fiber and about 3,000 feet from the homes, there is a prism that splits the light and sends the signal to multiple destinations," Gibbs says, adding that 75 percent of total architecture costs generally come from putting the box in at the subscriber's home. If the box is

Looking For Trouble?

Tempo's test equipment identifies faults in inside wiring, such as bad jacks, opens, high resistance faults, series resistance faults, and defective splices. Increase your fault locating efficiency with Tempo's Sidekicks, TDRs and Cable Locators. Look to the future. Look to Tempo.



800-642-2155
760-598-5634 (fax)
www.tempocomm.com

SPEED MEANS NOTHING



IF THEY CAN'T GET ONLINE

And Every Second Counts.

Assets are at risk from Wall Street to Bob Sutter's den. It's hot business in a new world and reliable high-speed Internet access is vital.

So what happens if your operations center is facing an alarm storm from different network management elements, spread over multiple screens? How long will it take your team to diagnose the problem? The stock market closes in 20 minutes. You do the math. If you can't fix it fast enough, how long will it take Bob to find a new Internet provider?



One Screen. One Solution.

The Cheetah Solution can cross correlate a flood of alarms from multiple systems, in seconds. This "smart" system boils it down to a single, root-cause alarm—on just one screen. Is it a node, a transmitter or maybe it's return path ingress? Instead of rolling trucks all over town, this system pinpoints the problem so you can fix it, fast. All before the stock market closes. Cheetah. Unifying Your Network.

One Company. One Solution.



www.wwgsolutions.com
800-851-1202



www.cheetahtech.com
941-756-6000

© 2000 Superior Electronics Group, Inc. d/b/a Cheetah Technologies.

RF Distribution
Systems Status
Monitoring

Automated
Test Systems

Headend & Hub
Management

Network
Management

not installed until a customer actually requests service, 75 percent of the expense is prevented.

Is the Demand There?

BellSouth Corp. also touts the benefits of PON, saying it is part of the reason the company will now be able to move from fiber to the curb, to

"Now we can build fiber as cheaply as we can build copper."

—Verizon's Rick Hofman

FTTH. The company has announced a program to bring FTTH to 400 residential customers in Atlanta using a system designed by Lucent and Oki Electric Industry Co. Ltd.

"BellSouth's latest step provides the final link for an all-fiber connection from our switch all the way to the home, instead of terminating fiber-at-the-curb.

FTTH is BellSouth's ultimate platform for satisfying our customers' voracious appetite for bandwidth, an appetite that is growing at exponential rates," says Dave Kettler, BellSouth Science and Technology's executive director.

Yet, despite the talk, there are some like Craig Johnson, principal of PITA Group, who say greenfield builds and multi-tenant dwellings, especially new ones, are attracting FTTH, but the demand, the price point, and cost of build-out are just not right for retrofitting.

"We are not at a point in history where everyone is going to be demanding fiber-to-the-home let alone companies being able to afford being able to put fiber-to-the-home in older major metropolitan areas because of the huge cost," he says.

"It is taking place in multitenant buildings and businesses, but how

many are doing fiber-to-the-home. It is taking place in new developments," Johnson said, adding, "With a new installation, they put in whatever cable they can think of."

Verizon says its plan will be methodical. The plan is to begin a transition from spending the company's annual network construction budget of \$7 to \$8 billion on copper to fiber.

"It won't be a special program. It will be a change in what we do. It will be massive and widespread.... Competitors have targeted small things. This will look like peanuts compared to what will happen when billions of dollars per year are spent on it," Hofman says.

Even so, only 5 percent to 10 percent of the network is worked on within any given year, he adds.

CoreComm will concentrate first on multitenant dwellings, but Blumenthal sees anyone online as a potential customer.

"In our world, 40 percent of people have Internet access. We believe this is a very attractive solution for those people.... FTTH will be bigger than the cellular industry, which is worth \$45 billion after 18 years," he explains.

He also believes people will be willing to pay a "premium, but not a terribly significant premium" compared to cable modems and DSL services.

Johnson is not as sure, explaining that currently \$40 seems to be the magic number for advanced services.

"I am a firm believer of convergence, but convergence is not even close to being a reality," Johnson adds.

If you ask Johnson, the hype is still just that—hype. The fact remains vendors have been fine-tuning necessary equipment and the telcos are optimistic. At the very least, they, and even Johnson for that matter, say multitenant buildings and greenfield builds are happening. **CT**

Monta Monaco Hermon is contributing editor to Communications Technology. She can be reached at mmhermon@earthlink.net.

Did this article help you? Let us know your thoughts. Send an e-mail to snayalkar@phillips.com.

Total Headend Switching and Control



3000R-157
(Program Timer)



627A
(2x1 Audio/Video
Switch)



3000R-165
(RF and Audio/Video
Relay Panel)

"Call us, we'll help you make the switch"

800-922-9200

www.megahz.com • engineering@megahz.com

MHz
MEGA HERTZ
Established 1975

STOCKS

ME
MONROE
ELECTRONICS

"Unique" Products For the 21st Century!

Oregon, Arizona, Colorado, Texas, Missouri, Ohio, Pennsylvania, Georgia, Florida, New Hampshire

**NO IFS,
ANDS,**

OR BOLTS

Leave your tools in the truck. With our exclusive latching system, the FOSC 600 Closure is a cinch to use. No ifs, ands, or bolts—well, actually there are two, but the FOSC 600 is still the most user-friendly closure in the business.

**The FOSC 600™ Platform
with the GelSeal Closure System**

tyco

Electronics

Raychem

make your
network
gel.

The
AEB
of **Expansive
Loops**

By David L. Jones

CEES

on

This month, we introduce the first in a three-part series intended to reinforce foundational issues of coaxial construction, expansion loops, connectorization and maintenance, and explain why attention to these areas is especially critical today. Part one this month covers the importance of expansion loops.

If you are a project manager, engineer, technician or contractor for a modern hybrid fiber/coax (HFC) build, you are being called on to master new technologies, such as digital transmission, sophisticated test gear and telephony applications, all with precious little resources or time. You need your RF plant to work at much higher frequencies, and more reliably, while it is probably being built by folks with less experience than ever before.

That's why understanding the foundations of RF plant are important. This month, we explain the role of expansion loops in coaxial cable.

The majority of cable TV aerial cable plants are constructed with the coaxial cable lashed to a steel strand for pole-to-pole support. Lashing these two cables together joins two very different materials into a single unit.

As the ambient temperature rises and falls, a competition ensues between the coaxial cable and the steel strand, one that the coaxial cable cannot hope to win.

To prevent damage to the coaxial cable, expansion loops have been placed at all fixtures throughout the aerial plant. As important a role as the expansion loop plays, some in the field still consider it an optional part of the aerial plant. They look upon it as a handy site for pilfering cable slack, and its distortion or elimination hardly raises an eyebrow. Our goal here is to focus on the important role expansion loops play in preventing cable damage and to review the rules governing their installation. >

FIGURE 1 AN INSTALLED EXPANSION LOOP



BOTTOMLINE

> The Role of Expansion Loops in Cable Plants

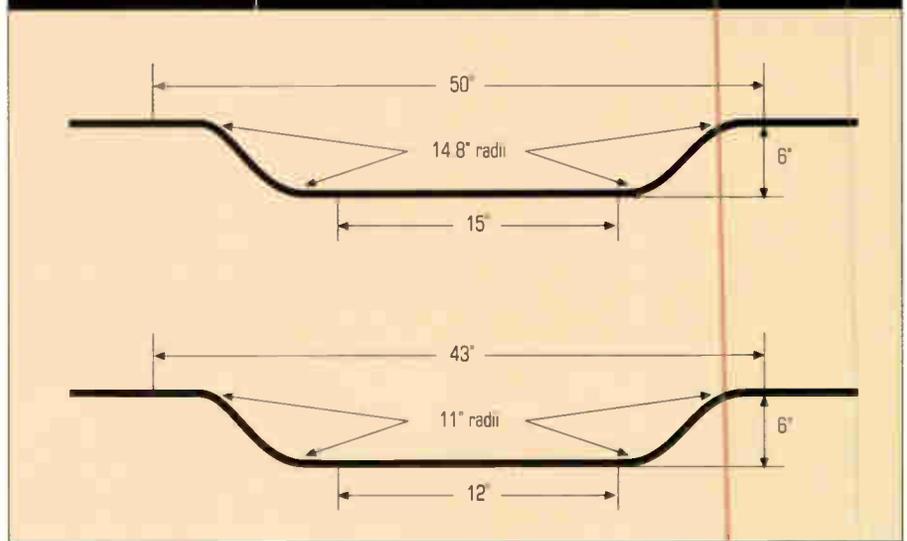
In the expansion/contraction tug-of-war contest of a cable TV coaxial cable lashed to a steel strand, the steel strand wins hands down, while the coaxial cable is always the one that gets damaged. That's why in a lashed coaxial cable plant, there is always a need for some sort of stress release device, such as expansion loops, for the coaxial cables.

Expansion loops are inserted in cable plants to protect the coaxial cables from damage. They provide the coaxial cables places to safely expand and contract while lashed to a steel strand and connected to a variety of fixtures.

Things to remember:

- Expansion loops are required in all lashed cable TV aerial coaxial cable plants.
- Expansion loops are required at all fixtures.
- Mechanical benders are recommended for more consistently formed loops.
- When lashing smaller and larger cables to the same strand, use the loop size of the larger cable.
- If multiple cables are running on a strand, they should not be tie-wrapped together in the same loop.
- Do not over-tighten the straps that support an expansion loop.
- Expansion loops should not be altered or eliminated.

FIGURE 2 EXPANSION LOOP DIMENSIONS



Expansion loops

Much of the data we have on the expansion of coaxial cable has been obtained through laboratory tests, which have been conducted using a 56° F temperature swing to simulate an extreme daily change of temperature and a 68° F temperature swing to simulate an extreme seasonal change of temperature. These two swings taken together reveal that under extreme conditions, a coaxial cable could experience a total temperature swing of 124° F. A temperature swing of this magnitude can produce a change in cable length of up to 3.5 inches.

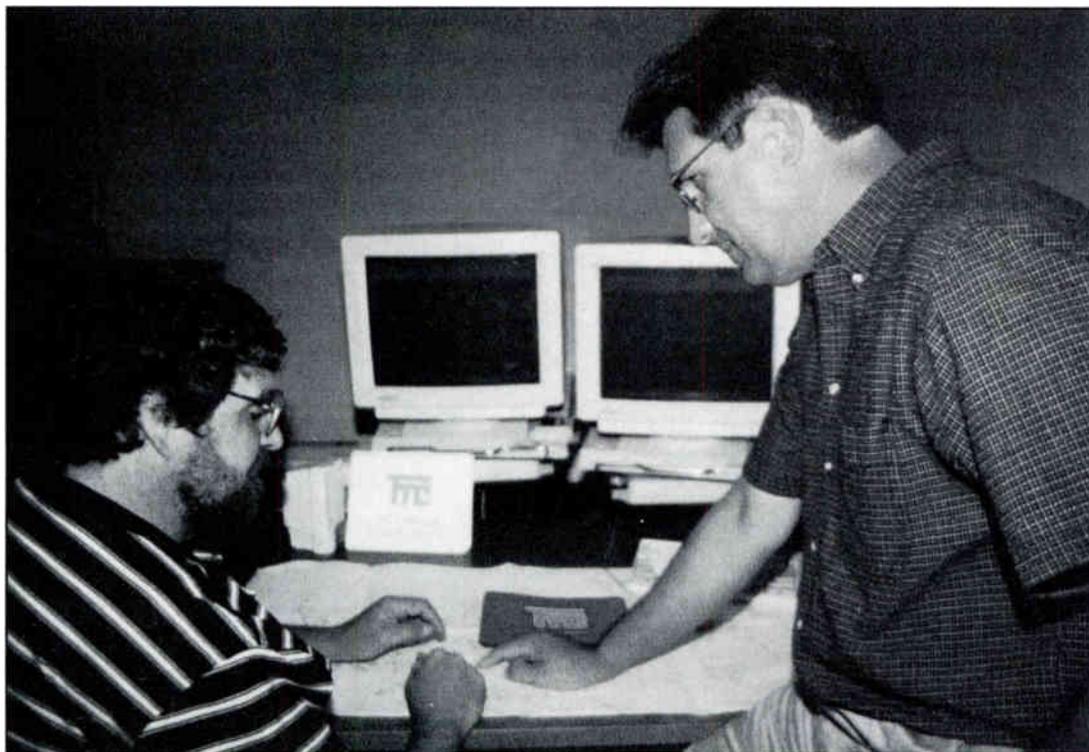
As the ambient temperature around the cable plant increases, a coaxial cable needs to expand at a much faster rate than its supporting steel strand. It will begin to move outwards at each of its ends. As the difference in length between the strand and the cable increases, stress is generated in the cable if it is unable to move. This is why expansion loops are critical to cable life while using no more than an extra 2- to-3 inches of cable.

Where expansion loops have been provided, the stress is released into the loop. Where expansion loops are not provided, the stress is released into the cable's weakest location. Stress will continue to build in the cable until there is enough stored energy for it to form its own expansion loop. A stress-induced expansion loop is formed when the stress built up in the cable forces the cable out through the lashing at its weakest point. An expansion loop formed in this manner has a high probability of kinking and damaging the cable.

Expansion loops are required where the potential for stress exists. For an expansion loop to be effective, it must be correctly formed and installed. Each loop must be formed according to specifications whose criteria will produce precise bend radii and bottom lengths within the loop. It is crucial that the installer know where to place the loop, the correct forming equipment to use, how to use the equipment and finally how to secure the newly formed expansion loop. >

**We Have 13,893 Amplifiers,
1,716 Power Supplies, 1,318 Nodes,
1,037 Miles of Fiber, 4,896 Miles of Coax.**

How Do We Keep Track Of It? 



Tele-Media Corporation of Delaware, Pleasant Gap, PA

www.cisfocus.com

Sales@cisfocus.com

Contact Lynn Hamlin at

678-482-2000 Ext. 101

C.I.S.



Communications Information Software

Helping Build and Manage the Information Superhighway

pads

equalizers

plug-ins

new & refurbished electronics

passives

refurbished converters

MAINLINE

INCORPORATED



800.444.2288 ■ Phone: 310.715.6518 ■ Fax: 310.715.6695

20917 Higgins Court, Torrance, California 90501 ■ www.mle.com ■ Email: mainline@worldnet.att.net

bender to form a 6-inch deep by 15-inch long flat-bottomed loop with 14.8-inch radius curves.

An expansion loop can be formed using either a mechanical bender or a bender board. Mechanical benders hang from the strand by hooks and use ratchet pressure to bend and form the loop. A bender board, on the other hand, is just as its name implies; it's a

board cut into the shape of the expansion loop. It is lifted into place between the strand and the cable and held there by hand. The cable is then manually pressed against the bender board to form an expansion loop. It is strongly recommended that mechanical benders be used because they produce more consistently formed loops.

To form the loop, attach the mechan-

ical bender to the strand at the appropriate location. Place the cable in the bender and form the loop according to the manufacturer's directions. Carefully inspect the cable for any damage caused by possible misalignment.

If the loop is formed before the cable is lashed to the support strand, do not remove the bender until after the cable has been lashed at least 50 feet, or to the next pole, because tensions imposed during lashing may deform the loop. Once the cable is lashed and the lashing wire is tied-off, the bender may be removed.

If multiple cables are running on a strand, they should not be tie-wrapped together in the same loop. Each cable must be permitted to move independently within the loop or the cable may buckle and fail. When lashing a combination of both small and large cables to the same strand, it is recommended that the larger loop be used for all cables on the strand.

The final step is to install the attachment hardware of straps and spacers between the cable and the strand at the loop. An expansion loop is supported on the strand by a strap fitted with a spacer that separates the cable from the strand. Do not over-tighten the straps. They should be no more than hand-tightened. Their installation must be such that the cable is free to move in and out of the loop.

Expansion loops must never be eliminated or altered and are never to be used as a source of slack when repairing or replacing connectors. Great care has been taken to precisely form each expansion loop with one specific task in mind: to protect the cable from damage. Altering an expansion loop's form from its original dimensions cripples optimum loop performance and inserts the potential for cable failure. Don't mess with an expansion loop unless you know what you're doing! **CT**

David L. Jones is senior applications engineer for CommScope. He can be reached at djones@commscope.com.

Is this story useful to your business? Let us know your thoughts. Send an e-mail to snayalkar@phillips.com.

Ready to GO!

SMART ONE
HIGH PERFORMANCE
CABLE MODEM
Model CMX110

More Than 100 Times Faster Than Analog Modems!

- Always On, No Waiting For Dial-Up
- View Internet TV, Live Concerts, Movies And More
- Embedded Privacy And Security
- DOCSIS 1.1 based Software Upgradable

Excite@Home
CABLELabs
READY
BEST DATA
WE PUT THE WORLD AT YOUR FINGERTIPS

**Get New
Subscribers
with
Best Data
Cable
Modem!!!**

Ready

- ✓ 24/7 Tech Support
- ✓ CableLabs Certified
- ✓ Self Install CD
- ✓ Excite@Home Approved
- ✓ Field Upgradable
- ✓ Superior Performance

Represented by

MHz MEGA HERTZ

800-922-9200



BEST DATA



Los Angeles, California www.bestdata.com

DOCSIS

Noise Com's UFX-99CA Programmable Noise Generator, the ideal solution for setting C/N, E_b/N_o



The Noise Com UFX-99CA features:

- Internal signal and noise combiner** for **simple** test set up.
- Easy to read 4x20 character **LCD display** showing attenuation, switch and status data.
- Local **Keypad** and remote **GPIO** system control.
- Optional **filtering** with calibrated noise bandwidth.
- Optional **TTL on/off control** of noise or signal for precise burst interference emulation.
- Custom filtering and power levels.**
- Exceptional **noise flatness.**
 ± 0.1 dB/10 MHz, typical.
- Precision attenuation** adjustments with **0.1 dB** resolution.

Test Smarter!

Contact **Noise Com** today for more information on our **Broadband Test Equipment Product Line.**

Noise Com

E. 64 Midland Avenue
Paramus, NJ 07652
Phone: (201) 261-8797
Fax: (201) 261-8339
Email: info@noisecom.com
Web site: www.noisecom.com

NOISE/COM

Before



the

Customer Calls:

Problems with Network Maintenance

By Bruce Bahlmann

The last thing you want to receive is a customer call informing you that your network has malfunctioned. Network monitoring software might help you head off some of those phone calls, but so far, there is no cure-all.

As multiple system operators (MSOs) ramp up for the next round of the battle for broadband supremacy, maintaining service quality and network reliability have become critical to business. The importance of monitoring has been elevated as a component of providing quality service. With multiple services sharing the same medium, MSOs must ensure all facets of the delivery system are kept in check.

This requires MSOs understand:

- What each service requires to run optimally;
- How each service interacts with one another; and
- What triggers loss in performance or service interruption.

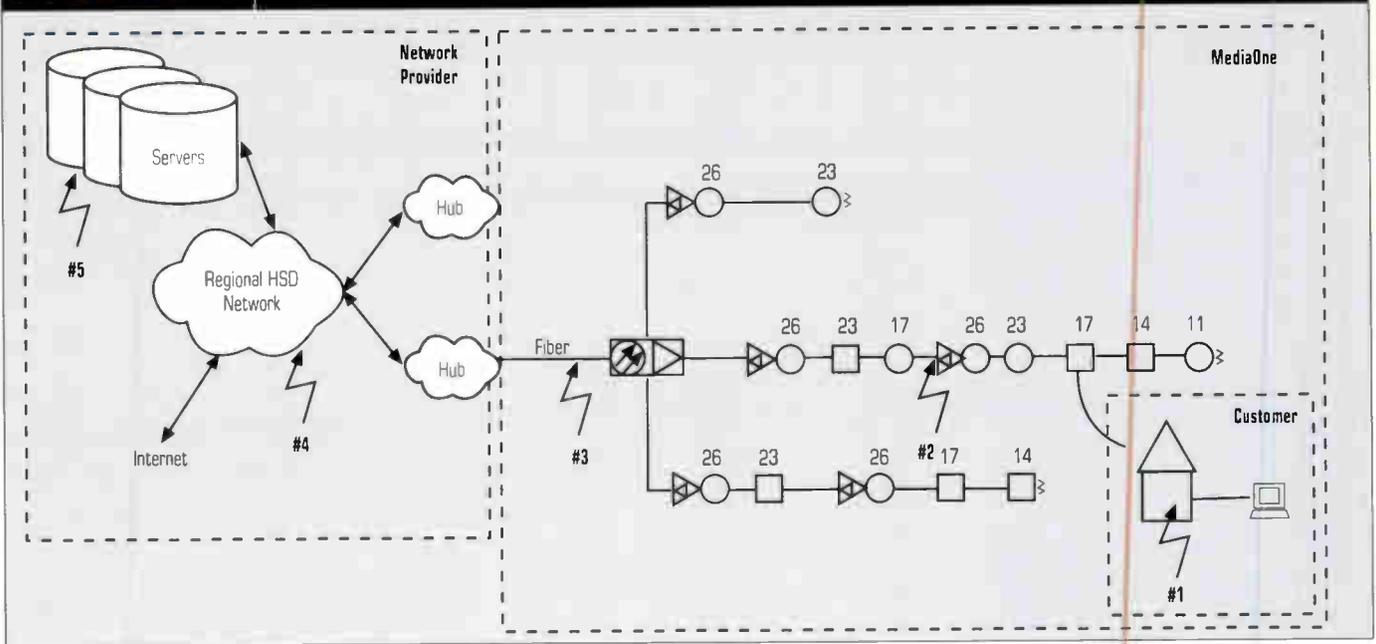
Overview of monitoring and network management

Monitoring is a means of gathering and examining information in an effort to maintain service quality and reliability. The frequency and scope of information gathered depends greatly on what is being monitored and the way it is being monitored. There are several different ways of monitoring, including:

- Watching for change (improvement or deterioration) in something, perhaps beyond certain thresholds;
 - Watching for the absence or presence of something; and
 - Watching for a specific event or sequence of events to take place.
- Determining what to monitor re-



FIGURE 1 HIGH-SPEED DATA SERVICE SYSTEM



quires an understanding of the “system” and what collection of items (or network elements) provides the best visibility into the inter-workings (or operations) of the system. Fault, Configuration, Accounting, Performance and Security (FCAPS) represent a network management model used industry-wide to provide good visibility into the operation of most services. The FCAPS model (whose elements are defined in Table 1, page 132) recommends particular network management areas of focus that would enable one to comprehensively monitor services and achieve and maintain good service quality and reliability.

As a result of monitoring areas of focus (such as those in FCAPS) in the ways discussed previously, one might hope to trigger one of the following:

- Proactive response—Information that would enable something that is deteriorating to be detected, allowing repairs to be made prior to failing, and eliminating potential service interruption.
- Reactive response—Information that would enable engineers to detect something that is broken, allowing repairs to commence independently of customer service calls.

The responses depend on the proper configuration of all network elements being within network

FIGURE 2 CUSTOMER PREMISE OUTAGE

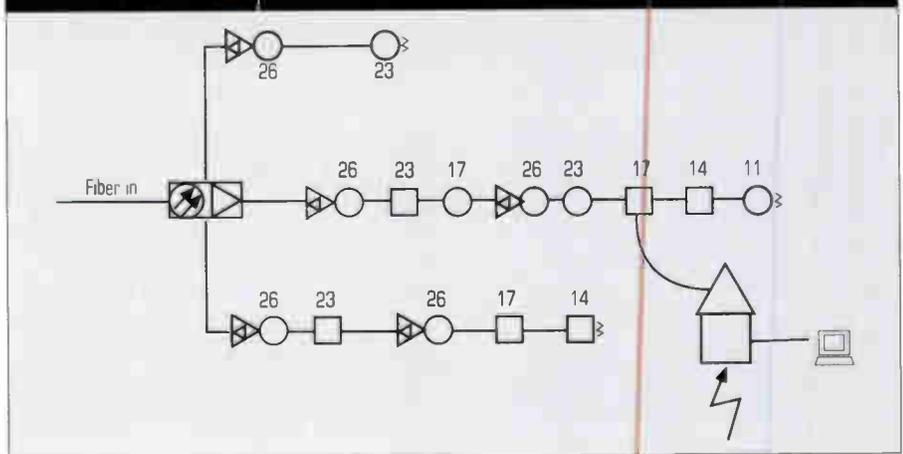


TABLE 1 FCAPS NETWORK MANAGEMENT MODEL

| Management Type | Network Management Area of focus |
|-----------------|--|
| Fault | Monitoring network failures |
| Configuration | Monitoring physical and logical inventory of network equipment |
| Accounting | Monitoring how services are billed (i.e. telephony bills for call records) |
| Performance | Monitoring degraded network performance (i.e. dropped calls, blocked calls, etc.) |
| Security | Monitoring network access and the security of the network (such as audit trails on UNIX servers) |

Source: MediaOne

management visibility. An erroneous response, or none at all, could result from improper configuration of network elements. The proper configuration of individual network elements enables higher-level network management to occur. The network management forms relationships between two or more triggered events, allow-

ing one to identify a probable cause—which may not have yet triggered. This level of analysis requires sophisticated network management software, skilled staff to manipulate this software, and, most importantly, extensive knowledge and experience of all network elements within the network management visibility. >

The GUARDIAN Return Path Maintenance System

...from Trilithic

Reliable return path performance demands precise system setup, ingress-proof subscriber installations and continuous ingress monitoring. And you will need fast location and correction of problems when things go wrong.

The Guardian system is the only return path maintenance solution that covers all of these tasks seamlessly, efficiently and inexpensively. For the hundreds of systems that rely on Guardian, high return path quality is just plain innovative engineering.



The RSVP™

The RSVP tests the entire return path, and gives a simple PASS or FAIL message. Just connect the GUARDIAN RSVP in place of the subscriber's terminal and press the TEST button.

The 9580-SSR™

The 9580 SSR field unit generates reverse path signals and displays balancing and ingress measurement data transmitted from the SST Reverse Path Analyzer. The SSR is small and light-weight and very simple to use.



The IsoMeter™

Used with the RSVP, the IsoMeter tracks down faulty cabling. There is no faster or easier way to test the home cabling for resistance to signal ingress.

Ingress Management Software™

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



The 9580-SST™

The 9580-SST is the heart of this complete quality management system. Each SST Return Path Analyzer unit collects balancing and ingress measurement data from one to eight test points, and transmits the updated measurements to the SSR field units. The SST also operates as an unequalled ingress monitor, capturing 80 ingress scans per test point, per second.

call now for more information:
800.344.2412 or 317.895.3600

GUARDIAN™
SYSTEM

Return Path Maintenance Technology



TRILITHIC
INNOVATIVE ENGINEERING

FCAPS provides network management with focus areas that must be sufficiently monitored to ensure reliability of a high-speed data (HSD) network.

Example: HSD system outage analysis

There are several components of the HSD delivery system that are critical to providing reliable service—some are under our control (plant, head-end) and some are not (the customer's home, servers, regional network and so on). Before we can monitor HSD (or establish requirements for it), we must evaluate various points in the system where service interruptions can occur and prioritize the effort required to effectively monitor them. The components of the HSD system (ranked in order of small to large in terms of the scale at which they may effect customers) are:

1. Customer premise
2. Node segment
3. Node wide
4. Network

5. Server

6. Third party (not location specific)

Figure 1 (page 132) describes the delivery system for HSD, indicating possible locations of the service interruptions described. The boxes drawn around groups of network elements represent their respective ownership.

If one were able to monitor in such a way that all these components were covered, the result would be comprehensive network management of the HSD service. Today, though, there is no one network management system that will provide this comprehensive network management (certainly not one that is completely open and standards-based). Therefore, we must evaluate the service interruptions and continue to focus attention on each component of the HSD service system until such time as all sources of service interruption are visibly addressed by network management.

Customer premise outage

Only a single customer is hurt by a customer premise outage (Figure 2, page 132). Causes of this type of outage include:

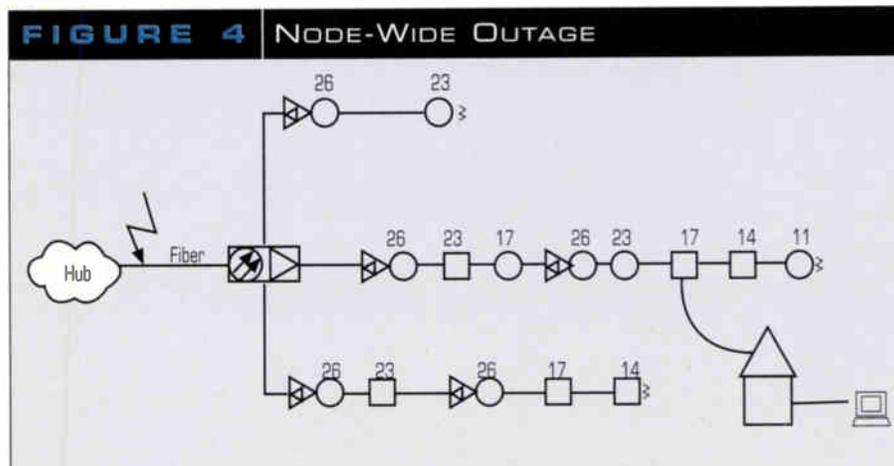
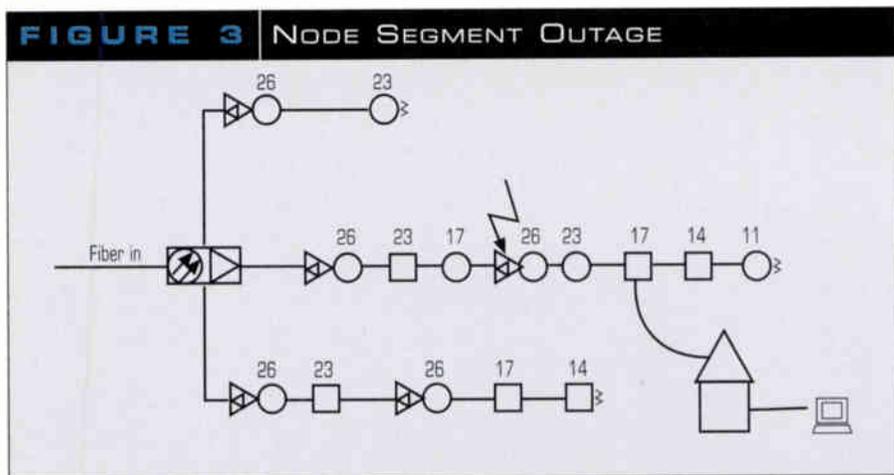
- Software installation conflicts
- PC re-configuration
- Hardware failure [cable modem, network interface card, USB adapter, or customer premise equipment (CPE)]
- Cable (coax, 10BaseT, or USB) problems (cut or damaged connector)
- Errors rewiring or splicing cables
- Downed, damaged or cut cable drops
- Localized power failure

Customer premise outages could be indicated by:

- Customer call reporting outage
- Cable modem not pingable
- CPE not pingable
- No television reception

The results of this type of outage can range from one of the following (from bad to worse):

- Loss of customer confidence in the service, based on how quickly the



BOTTOMLINE

> All-Inclusive System Needed for Network Management

To a large extent, many broadband operators rely on customer complaints in helping them determine the severity of a developing outage. This is not by choice but rather because of the general lack of standardization regarding network management. As a result, broadband operators are forced to purchase proprietary network management systems that yield a limited view of the health of their overall system. Piecing several of these systems together provides broadband operators with spotty visibility over their entire system. By pushing for more open systems and standardization, broadband operators hope to one day use a single network management system to oversee all their services.

Leader's LF 982 Measures Digital & Analog RF Signal Levels for TV/Cable/Satellite



PICK HIT
ENGINEERING
2000

\$2495, in Stock

| | |
|------|---|
| QAM | ✓ |
| QPSK | ✓ |
| 8VSB | ✓ |
| OFDM | ✓ |
| NTSC | ✓ |
| PAL | ✓ |

- VHF, UHF, FM, CATV and SAT Operation
- Analog, 8VSB, OFDM, QAM-256, QPSK, BPSK & 8PSK Modes
- Broadcast TV, CATV and Sat Tables
- Single/Multi-Bargraph/Spectrum Display Backlight
- Video/Sound Monitor Outputs (Analog Only)
- Stores 200 Measurements and Settings
- Compact, Lightweight with NiCd and Charger
- Satellite C/N Ratio, Coaxial AC/DC Volts
- Programmable Tables and Volts for LNB
- Flash Card Transfer Data and Cloning
- RS-232C, Print/Data Output

1 (800) 645-5104 / www.LeaderUSA.com

LEADER

FOR PROFESSIONALS WHO KNOW
THE DIFFERENCE

6484 Commerce Drive, Cypress, CA 90630 Tel: (714) 527-9300 Fax: (714) 527-7490
Regional Offices: Atlanta, Boston, Chicago, Cleveland, Dallas, Los Angeles, New York

customer is brought back online

- Cost of service call to fix loss of service caused by customer
- Potential problems with other customers due to ingress caused by drop or customer's improper wiring

Network management opportunities

Monitoring individual CPE is difficult to justify and yields unpredictable results (I will explain this in next month's article on monitoring customers vs. end of the line). While there are products on the market that can discover network elements, because these elements are dynamic and because they are not under MSO control, they can not be used to detect possible or actual outages. As a result, few, if any, opportunities exist for network management in the area of the customer premise.

Node segment outage

A node segment outage (Figure 3, page 134) impacts customers connected beyond the location of the outage. Causes of this type of outage include:

- Hardware failure (mainly active components such as amplifiers but could also be passive components like taps, direct couplers, splitters and so on);
- Signal loss from a damaged or cut plant; and
- Localized power failure.

A node segment outage could be indicated by:

- Customer service calls (typically takes some minimum number before it is considered a potential outage);
- Equipment alarm—if outage was caused by the loss of some active component; and
- RF alarm—considerable swing in network performance (good or bad)—may require a large portion

of the plant to be out before most RF monitors can sense the outage in this fashion.

The results of this type of outage can range from:

- Outage causes ingress that inconveniences other customers (areas of the plant) and makes the problem more difficult to locate;
- Need to involve a third party (power company) to fix problem;
- Loss of customer confidence in the service, especially since it is out of their control;
- Credits may be required in some cases if the problem takes considerable time to locate and fix—note that if this happens at night, it may not be fixed till the next morning because of the risks associated with repairs on elevated cables at night; and
- Loss of customers seeking more reliable service. >

FIGURE 5 NETWORK OUTAGE

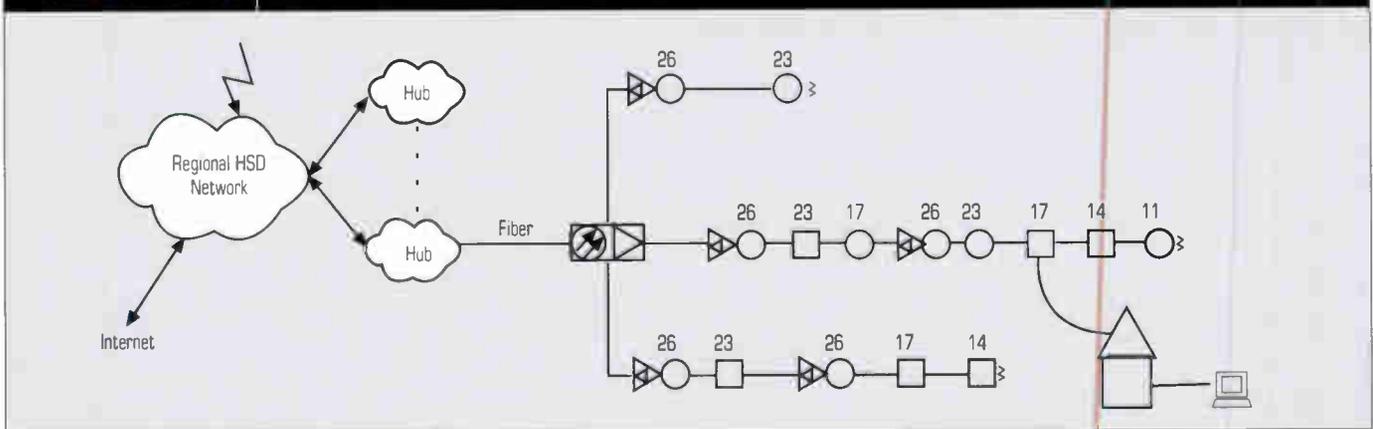
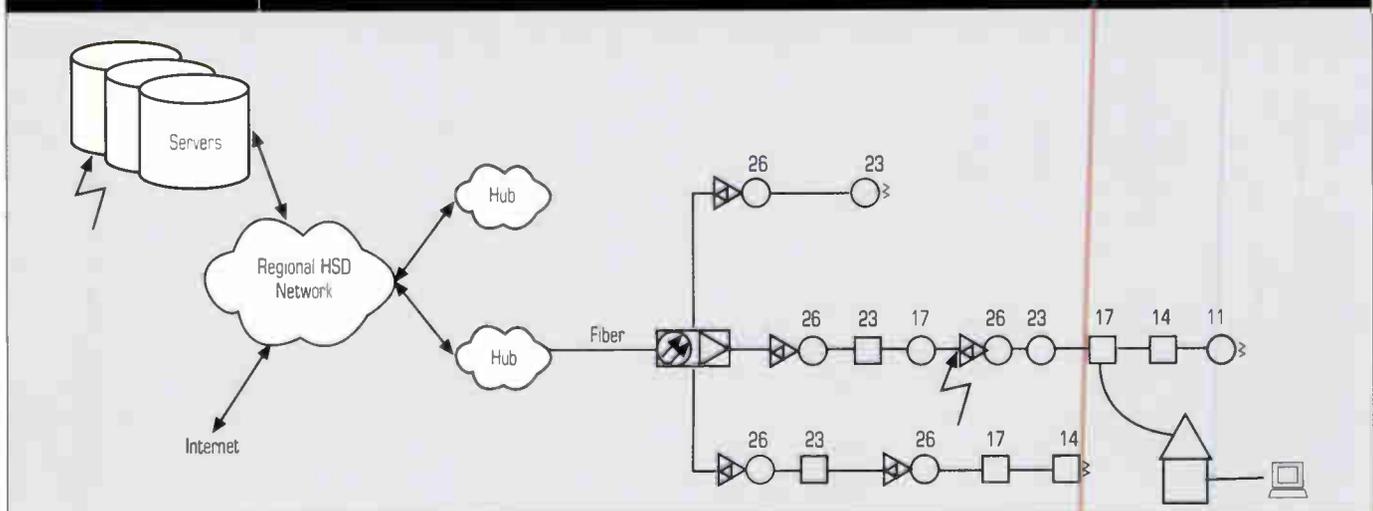
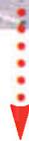


FIGURE 6 SERVER OUTAGE



Built for *speed.*

[OF DEPLOYMENT]



While you're busy managing site acquisition and zoning details for your rebuild, Oldcastle is already under way on the precast structure to house the electronics. In fact, we'll have it completed and ready for inspection in as little as two weeks after notification to proceed. Compare this to the months required for conventional "from the ground up" designs...and it's easy to see how Oldcastle structures let you turn on the revenue stream much sooner. Your Maxi-Mod™ structures will be installed on schedule, regardless of whether you are deploying five units or twenty, in one city or in multiple locations. For consistency, each structure is designed with a common look and layout. At the same time, its modular construction lets you vary the square footage to match your equipment needs. Get up to speed today.



Contact: 215.453.3606
www.oldcastlecomm.com

Network management opportunities

Ironically, network management providers have focused least on this area, yet it is most critical to MSOs. As a result, many opportunities exist for new ways to provide MSOs the visibility necessary to detect and pinpoint partial node failures. New solutions in this area would allow MSOs to reduce their exposure to this type of outage, reducing the time it takes to locate and repair it.

Node-wide outage

A node segment outage (Figure 4, page 134) impacts customers connected to a specific fiber node. Causes of a node-wide outage include:

- Hardware failure, such as transmission equipment and cable modem termination system;
- Signal loss from a damaged plant; and
- Localized power failure.

Indications of a node-wide outage include:

- Network alarm that node is off line;

- RF alert about something similar; and
- Multiple customers call in outages.

The results of this type of outage can range from :

- Difficulty finding the outage—since locating requires a cable/fiber cut to be visible and the time it takes to determine this could be lengthy since plant can span miles, some of which may not be 100% visible (night-time outages can complicate the locating exercise further);
- Loss of customers; and
- Bad press.

Network management opportunities

Place an Optical Time Domain Reflectometer (OTDR) on fiber runs that are sufficiently exposed. If we combine OTDR with GPS tracking of the route taken by the fiber run, it would allow network operators to dispatch service technicians to the exact location of the break and speed repairs by as much as 50 percent, or the time it takes to locate

the break. This is not recognized as a requirement for HSD monitoring, but should be considered if a standardized monitoring strategy is adopted.

Network outage

A network outage (Figure 5, page 136) impacts the customers connected to the troubled network segment.

Causes of this type of outage include:

- Hardware failure (CMTS, Router, and so on); and
- Loss of link (cut or damaged cable, bad transmission cards).

Network outages are indicated by:

- Network management alert on link;
- Increased or no traffic on redundant links; and
- Customer complaints about speed.

The results of this type of outage can range from:

- Slower Internet service; and
- Higher dependency on alternate paths (in a number of cases there are only two routes to a network) creating a single point of failure

The Choice is Yours...



Traditional Paper Maps

OR



The Field Mapper

Call Today for
more information



**LODE DATA
CORPORATION**

Tel: (303)759-0100

Fax: (303)759-0211

www.lodedata.com

Lode Data
Not "Just"

World-Class Design and Drafting
Software Anymore!

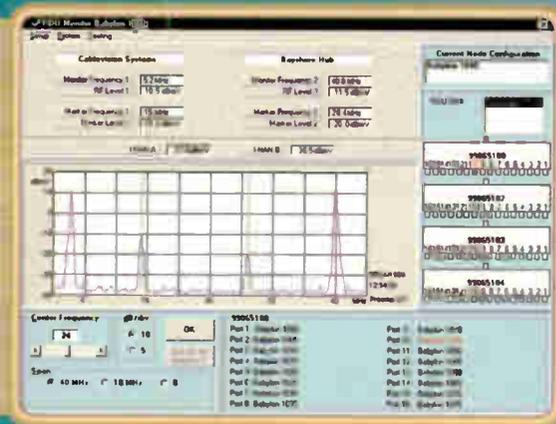
Create Maps
Collect Data
Increase Accuracy
Improve Efficiency

Simple brilliance.



CABLE RESOURCES INC.

**A Return RF Meter, a Spectrum Analyzer,
a Return Maintenance Monitor. All with Remote Control!
The RDU[®] is the Right Tool for the job.**

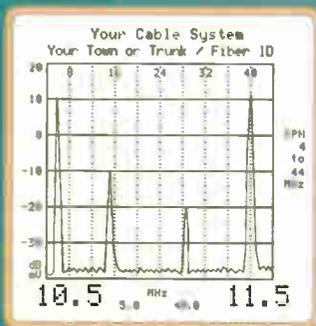


Monitor Screen with Integrated RF Switches

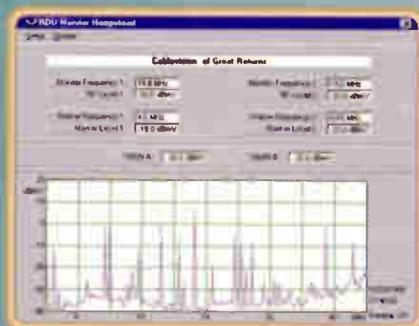


RDU[®] RETURN DISPLAY UNIT

- 70 dB Dynamic Range
- Integrated RF Switching
- Automatic Test Carrier Levels
- I-NAN[®] Maintenance Monitoring
- Displays Impulse Noise and CPD



Video Output with Test Carrier Levels



Monitor Screen: Impulse Noise Present

| Chan | Freq | Level | Chan | Freq | Level | Chan | Freq | Level |
|------|------|-------|------|------|-------|------|------|-------|
| 4.2 | 9.2 | 14.2 | 15.2 | 24.2 | 29.2 | 34.2 | 39.2 | 44.2 |
| 4.4 | 9.4 | 14.4 | 15.4 | 24.4 | 29.4 | 34.4 | 39.4 | 44.4 |
| 4.6 | 9.6 | 14.6 | 15.6 | 24.6 | 29.6 | 34.6 | 39.6 | 44.6 |
| 4.8 | 9.8 | 14.8 | 15.8 | 24.8 | 29.8 | 34.8 | 39.8 | 44.8 |
| 5.0 | 10.0 | 15.0 | 20.0 | 25.0 | 30.0 | 35.0 | 40.0 | 45.0 |
| 5.2 | 10.2 | 15.2 | 20.2 | 25.2 | 30.2 | 35.2 | 40.2 | 45.2 |
| 5.4 | 10.4 | 15.4 | 20.4 | 25.4 | 30.4 | 35.4 | 40.4 | 45.4 |
| 5.6 | 10.6 | 15.6 | 20.6 | 25.6 | 30.6 | 35.6 | 40.6 | 45.6 |
| 5.8 | 10.8 | 15.8 | 20.8 | 25.8 | 30.8 | 35.8 | 40.8 | 45.8 |
| 6.0 | 11.0 | 16.0 | 21.0 | 26.0 | 31.0 | 36.0 | 41.0 | 46.0 |
| 6.2 | 11.2 | 16.2 | 21.2 | 26.2 | 31.2 | 36.2 | 41.2 | 46.2 |
| 6.4 | 11.4 | 16.4 | 21.4 | 26.4 | 31.4 | 36.4 | 41.4 | 46.4 |
| 6.6 | 11.6 | 16.6 | 21.6 | 26.6 | 31.6 | 36.6 | 41.6 | 46.6 |
| 6.8 | 11.8 | 16.8 | 21.8 | 26.8 | 31.8 | 36.8 | 41.8 | 46.8 |
| 7.0 | 12.0 | 17.0 | 22.0 | 27.0 | 32.0 | 37.0 | 42.0 | 47.0 |
| 7.2 | 12.2 | 17.2 | 22.2 | 27.2 | 32.2 | 37.2 | 42.2 | 47.2 |
| 7.4 | 12.4 | 17.4 | 22.4 | 27.4 | 32.4 | 37.4 | 42.4 | 47.4 |
| 7.6 | 12.6 | 17.6 | 22.6 | 27.6 | 32.6 | 37.6 | 42.6 | 47.6 |
| 7.8 | 12.8 | 17.8 | 22.8 | 27.8 | 32.8 | 37.8 | 42.8 | 47.8 |
| 8.0 | 13.0 | 18.0 | 23.0 | 28.0 | 33.0 | 38.0 | 43.0 | 48.0 |
| 8.2 | 13.2 | 18.2 | 23.2 | 28.2 | 33.2 | 38.2 | 43.2 | 48.2 |
| 8.4 | 13.4 | 18.4 | 23.4 | 28.4 | 33.4 | 38.4 | 43.4 | 48.4 |
| 8.6 | 13.6 | 18.6 | 23.6 | 28.6 | 33.6 | 38.6 | 43.6 | 48.6 |
| 8.8 | 13.8 | 18.8 | 23.8 | 28.8 | 33.8 | 38.8 | 43.8 | 48.8 |
| 9.0 | 14.0 | 19.0 | 24.0 | 29.0 | 34.0 | 39.0 | 44.0 | 49.0 |

I-NAN[®] Monitoring Parameters

The RDU[®] is a new type of return test system. You "see" the live condition of the return spectrum and RF level in dBmV at the HE, from any subscriber's terminal, amplifier, tap or fiber node.

The RDU[®] provides a "live" visual display of Carriers and Level, Ingress, Noise, Impulse Noise and Common Path Distortion.

With integrated RF switches, you select and monitor, a single node, a group of nodes or all the nodes in a Hub.

Node configurations are created by you, insuring an intuitive, easy to implement Return Management System.

RDU[®]'s monitor the noise floor, where you designate, by frequency. The RDU[®] averages the energy and

displays your benchmark I-NAN[®] number.

You gauge the noise floor's condition from a simple, trackable number!

I-NAN[®] numbers judge return performance over time by node or group. I-NAN[®] is a flexible, cost effective tool for proactive maintenance of return networks.

The RDU[®] provides frequency agile level cursors with a Delta in dBm V and a time/date stamp for cost effective engineering test operations.

Poll your nodes, isolating the problems for immediate attention. The RDU[®] is a tool for effective plant maintenance.

Monitor your return system on a TV channel and on your computer terminals via a Cable or LAN Modem.

Imagine live return at Dispatch. Customer Service and Engineering computer stations for constant maintenance monitoring.

The RDU[®] system opens the way to a logical, effective return operation.



CABLE RESOURCES INC.

85M Hoffman Lane,
Islandia, New York 11749-5007
FAX: 1-631-234-4436

**Call 1-800-537-9995 for
Sales and Product Information!
Visit us @ www.cricabletv.com**

RDU. Protected by one or more US patents and Patent Application including US Patent No. 5,956,074
RDU © 1997-99, Cable Resources Inc
RNS © 1997-99, Cable Resources Inc
I-NAN © 1998-99, Cable Resources Inc.

Network management opportunities

Since network outages span many types of networking gear (routers, switches, CMTS and so on) and network interfaces/links (POS, HSSI, FastE), it can be difficult to configure a network management station to effectively monitor all these technologies. (See *Communications Technology*, July 2000, page 62, for a related article

on network management to help you begin the planning stages for consolidated monitoring.) It is a good idea to seek out a network management consultant to help you develop your network outage monitoring strategy.

Server outage

A server outage (Figure 6, page 136) impacts customer care, installers, and all customers who require the use of

the service hosted by the server. Causes of this type of outage include:

- Maintenance problems (file system overload, operating system problem, and so on);
- Application failure; and
- Hardware failure.

Server outages are indicated by:

- Network operations center (NOC) alert on hardware failure;
- Customer care, installation and/or dispatch report of problem; and
- Customer complaint.

The results of this type of outage can range from one:

- Restart of application—momentary interruption of HSD business (sales, installation, customer care and customer outage);
- Replace troubled hardware (disk drive, NIC and so on) and configure—up to a few hours of service interruption; and
- Hardware swap (timely fix as there is no redundant hardware in place and before new hardware can work it must be properly configured to support the application)—extended down time (service interruption) that 'likely' needs to result in credits being issued.

Network management opportunities

Most network management software vendors have the ability to manage HSD applications (email, news and so on). However, some critical gaps exist in types of applications supported, which include managing DHCP/BOOTP as well as Application Programming Interfaces (APIs). These applications tend to be customizable and, as a result, can be difficult to monitor. Until they are sufficiently visible to your network management organization, there will be multiple ways your system could fail. This situation will make you rely on customers calling in before you can react and correct a failure.

Third-party outage

A third-party outage can impact various numbers of customers (from one to all). Causes of this type of outage include:

Why Norscan's new tone transmitter is attracting so much attention.

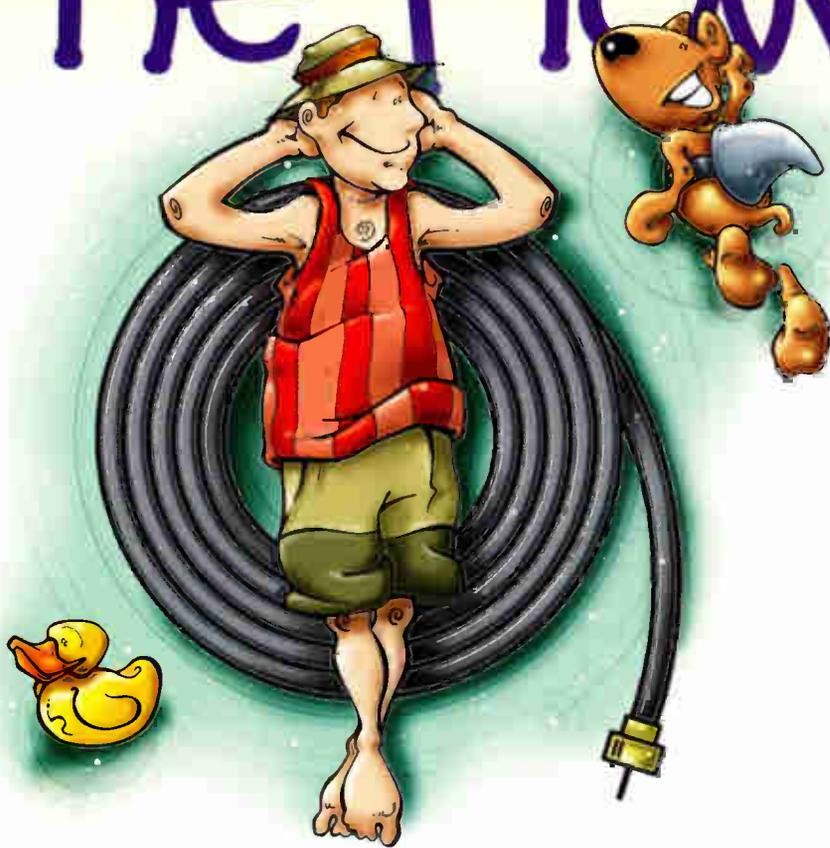


The affordable new Norscan 4200 CMS transmits user programmable tones on your cable. So it's compatible with the tone receiver you're already using. And it can be remotely switched to continuously monitor your outside plant. That means you'll avoid costly repairs and save time. Call us today for a demonstration.

norscan
www.norscan.com

7 Terracon Place, Winnipeg, MB Canada R2J4B3 Tel (204) 233-9138 Fax (204) 233-9188 E-mail sales@norsca.com
1232Commerce Street SW, Conover, NC USA 28613 Tel (828) 464-1148 Fax (828) 464-7608 E-mail us.sales@norscan.com

You worry about the
Waves.
We'll manage
The Flow.



NO MATTER WHERE YOUR TECHNOLOGY IS HEADING, WE'LL DELIVER IT.™

Networking. CATV. Telecom. Wireless. No matter what the demand, Power & Tel will keep you floating. We have solutions for all of your networking needs – solutions that help move your business forward. It's hard enough to weather the waves – let us help you manage the flow. That's the Power in Power & Tel. **Give us a call today and take a dip in success. 800-238-7514.**

NETWORKING • CATV • TELECOM • WIRELESS

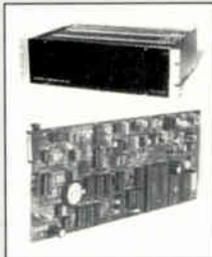


Satellite Receivers and Commercial Insertion Network Control Products

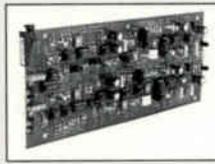
Unity Digital Video Satellite Receiver



For FOX & PAXNET NETWORKS



1601 Mainframe w/
Network Control Card



Stereo or Dual Mono
Audio AGC

"Call us for all your Wegener requirements"

800-922-9200

www.megahz.com • engineering@megahz.com

MHz
MEGA HERTZ
Established 1975

STOCKS

WEGENER COMMUNICATIONS

"Unique" Products For the 21st Century!

Oregon, Arizona, Colorado, Texas, Missouri, Ohio, Pennsylvania, Georgia, Florida, New Hampshire

- Faulty wiring (poor workmanship of contractor);
- Failed communications between broadband operator and contractor;
- IP address pool exhausted;
- Unplanned outages or down times that were not coordinated; and
- Failure to terminate automated HFC certification tests after turning plant back over to broadband operator.

Indications of third-party outages include the following:

- NOC alert on hardware failure;
- Failed installs in area where other customers are working; and
- Customer complaint.

The results of this type of outage can range from:

- Rescheduled installs or customer cancel install; and
- Delays in deployment of new service due to replacement of contractor.

Network management opportunities

Network management opportunities in this area mainly consist of check-lists, methods and procedures. To avoid these types of service interruptions, you need to formalize the check-in and check-out procedure you have with your contractor(s) and vendor(s). Similar to the development of software, HFC being checked out by a vendor/contractor should go through a check out procedure ensuring certain things are communicated. Likewise, when this HFC is being checked in, it should go through a different procedure to ensure that nothing is falling through the cracks. Without the check-in/check-out procedure, things will be overlooked and service interruptions will occur. The worst thing about these interruptions is that they are nearly impossible to find—potentially resulting in extended outages. **CT**

Bruce Bahlmann is senior systems engineer for MediaOne's Internet Services Group. He can be reached via e-mail at bahlmann@bigfoot.com.

Did this story help you? Let us know your thoughts. Send an e-mail to snayalkar@phillips.com.

Ad Insertion For your Budget. R172 Program Timer Plus

SERIES 3000
PROGRAM TIMER plus
TAPE PRE-ROLL

ME MONROE ELECTRONICS

Pre-Roll Active

Stereo A/V Switching
Tape Control
DTMF Override
Easy to Program

ME MONROE ELECTRONICS

1-800-821-6001
www.monroe-electronics.com

Your source for A/V switching and control products.





**Your cable modem
ad campaign worked!**

1500 orders came in...

TODAY.

Can your provisioning system cope?

With CoreOS, answering the challenge of scaleable and rapid deployment is easy. CoreOS is an innovative solution that brings together tools that allow you to increase daily activations and manage your network with greater flexibility and reliability.

Featuring an easy-to-use, web-based interface, CoreOS can help you reduce training costs and time. The solution contains a custom-built, high performance TFTP server that can handle over a thousand file requests per minute, decreasing the time required for provisioning modems and customer PCs. Dynamically generated files, based on individual subscriber profiles, are built "on-the-fly" and delivered to the modem.

CoreOS is an intuitive solution that enables self-provisioning. In less than five minutes subscribers are signed up online and generating revenue.

Another key to rapid deployment is powerful IP Address Management. The CoreOS IP Address Manager automatically tracks and assigns IP addresses to subscribers and provisions DHCP servers. It lets you know when more address space is required and shows you available address space with the click of a mouse.

CoreOS is the fastest and easiest way to get new cable modem subscribers online. With CoreOS, you can deliver what your ad campaign promises. **TODAY.**

Visit us in
**Booth #224 at
BCE 2000**
October 17 - 19, 2000
London, UK

Core
Networks

155 Chain Lake Drive, Suite 19
Halifax, Nova Scotia
Canada B3S 1B3
Toll free: (866) 855 2673
Tel: (902) 468 6397
www.CoreNetworks.com
info@corenetworks.com

CoreOS Broadband Provisioning System

Installing Cable Modems, Part 2

This month's installment continues a series on cable modem installation. The material is adapted from a lesson in NCTI's new Digital Installer Course. © NCTI

Installing various hardware in a customer's computer often is required in providing high-speed cable modem service. Last month's column addressed preparing the customer's computer and locating an available expansion slot to install a network interface card (NIC).

Installing the NIC

Before removing the NIC from its antistatic packaging or before touching any internal electrical components, put on a static-control wrist strap and attach its clip to a bare metal surface within the computer (Figure 1). Set the NIC on the top of the slot connector (Figure 2). Next, place your

thumbs on the top of the front and back of the card and, with firm and even pressure, seat the card into the slot connector (Figure 3). Replace the slot cover retaining screw.

Finally, replace the computer case cover and the cover retaining screws. Move the computer back into position, reconnect all cables, and prepare to start (boot up) the computer.

Installing a PCMCIA card

Because of its reduced size, a laptop computer is unable to use the industry standard architecture (ISA) or peripheral component interconnect (PCI) interface cards. Instead, a laptop

computer uses a Personal Computer Memory Card International Association (PCMCIA) card. The PCMCIA interface card comes with a network adapter cable (sometimes called a dongle) that has a unique thin card connector on one end and an RJ-45 connector on the opposite end (Figure 4). To install the interface, open the PCMCIA slot cover of the laptop and insert the PCMCIA card into the slot (Figure 5). With firm and even pressure, seat the PCMCIA card into the laptop's PCMCIA connector (Figure 6). The network Ethernet cable from the cable modem will then plug directly into the adapter's RJ-45 connection.

FIGURES 1-6

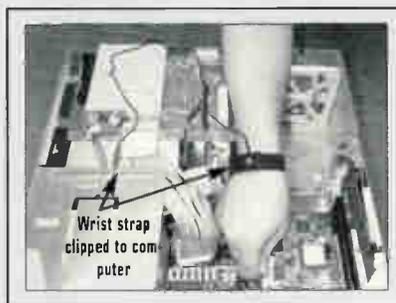


Figure 1: Using static-control wrist strap

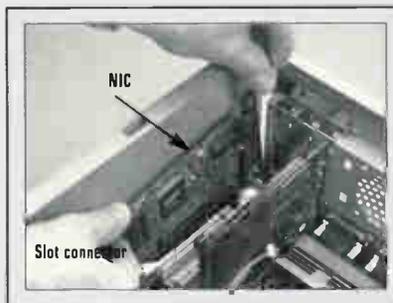


Figure 2: Seating NIC into top of slot connector

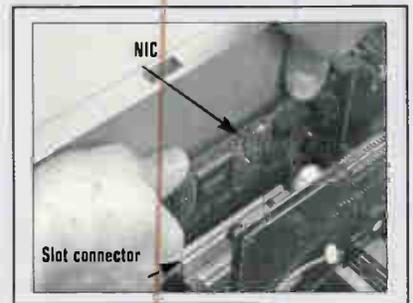


Figure 3: Seating NIC into slot connector

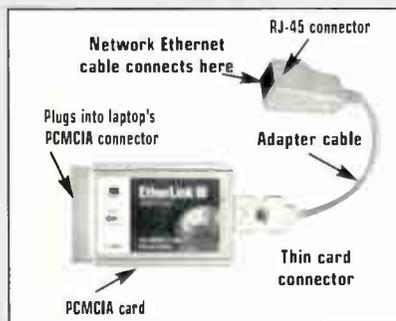


Figure 4: PCMCIA card and connectors



Figure 5: Inserting PCMCIA card into slot

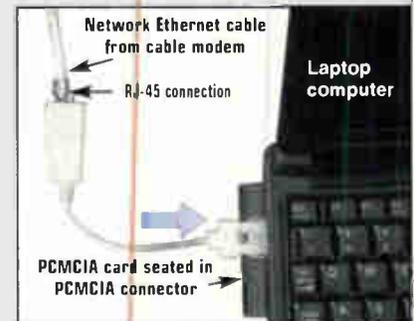


Figure 6: Seating PCMCIA card in connector

**REVERSE? Tulsat has hundreds of
reverse items in stock**

SystemAmp III

*750mhz Duals Hi
with reverse amp SA# 562462*

\$449.00

LE IIIs

*750mhz with 40mhz
with reverse amp SA# 574754*

\$249.00

TAPS, TRAPS, CONNECTORS



**Scientific
Atlanta**

FIBER OPTICS

LAZERS

450-750mhz

**RECEIVERS
NODES**

**OPTICAL REVERSE
REVERSE TRANSMITTERS**

HEADEND, MODULATORS, IRDS

SYSTEM IIs & IIIs

*Balanced Triples
Unbalanced Triples
Duals Highs/Dual Lows
Singles*

Line Extenders

Large Quantities In Stock



**ADDvantage
Technologies Group Inc.
Stock Symbol **ADDM****

SystemAmp II

550mhz 40/51

Triple Unbalanced SA#542766

(Made for cascading)

\$299.00

550mhz Triple

SA#501123

\$189.00

**GainMaker Amps & Line Extenders
Original SA EQs, Pads & AGCs**

TULSAT

**800-331-5997 - 1605 E. Iola
Broken Arrow, Ok 74012**

www.tulsat.com

LEE ENTERPRISE

**800-551-0096 - 701 3rd St.
Deshler, NE 68340**

www.leecatv.com

RACKMOUNT SERVER



➤ **Advantech Technologies'** IPC-601 1U-high server is designed for straightforward Internet/Intranet applications such as Internet service providers (ISPs), application service providers (ASPs), and Web and email servers. The device can offer up to 1GB of system memory, has flexible storage configuration and a built-in component failure monitoring system. The server's rackmounted backplane has expansion options in its peripheral component interconnect (PCI) slot and the capacity for a full-size central processing unit (CPU) card in its PICMG compliant slot.

For more information, contact Advantech Technologies Inc. at (858) 623-0838 or on the Web at www.advantech.com.

UPSTREAM LINE DRIVER

A low-power consuming line driver for cable telephony equipment and interactive digital cable terminals is available from **Texas Instruments**. The THS6101 line driver has a third-harmonic distortion of -64 dB at 29.3 MHz, a power level output of 56 dBmV and a noise level of -47 dBmV at its minimum gain and symbol rate. The device operates from a single 5-volt power supply and is designed as a Class-A amplifier for driving the upstream data path in Data Over Cable Service Interface Specification (DOCSIS)-compliant cable modem applications.

For more information, contact Texas Instruments at (800) 477-8924 or on the Web at www.ti.com.

OPTICAL TRANSCEIVER

Stratos Lightwave's ATM OC-48 small form factor (SFF) optical transceiver is a high-performance integrated duplex data link for multimode or single mode optical fiber and is compatible with standard LC fiber optic interface. The transceivers run at data rates up to 2.488 Gbps and are available in four

versions: three for 1300 nm single-mode applications and one for 850 nm multimode applications.

For more information, contact Stratos Lightwave at (708) 867-9600 or on the Web at www.stratoslightwave.com.

SDH MULTIPLEXER AND CROSS-CONNECT

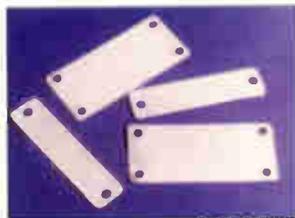
Tellabs' Focus LX system is a multipurpose synchronous digital hierarchy (SDH) multiplexer with integrated cross-connects that aids in the design of voice and data communications networks. The system can be deployed in all parts of an access network or transport and delivers integrated voice, video-on-demand (VOD) and high-speed data

to subscribers. Focus LX can sustain in-service upgrades, stand electrical and optical SDH, asynchronous transfer mode (ATM) interfaces and plesiochronous digital hierarchy (PDH).

For more information, contact Tellabs at (630) 378-8800 or on the Web at www.tellabs.com.

ID TAGS

Aluminum Write-On tags from **VIP Division** can be embossed for cable identification



with pencil or ballpoint pen. The tags are assembled

with aluminum facing bonded to a plastic core, and are suitable for any above- or below-ground permanent identification. Available in two sizes, the tags are pre-drilled for attaching.

For more information, contact VIP Division at (800) 950-4921 or on the Web at www.vipdivision.com.

MONITORING SYSTEM

Videotek's SpyderWeb unattended networked monitoring system allows for consistent monitoring and remote control of multiple vendor technical management (VTM) devices. The software application has an alarm feature, and initiates and displays frame captures to a remote computer running the program. SpyderWeb can monitor up to 99 VTM devices via Internet,

local area networks, wide area networks and serial communications.

For more information, contact Videotek at (800) 800-5719 or on the Web at www.videotek.com.



Hosted by
Communications Technology **Communications Technology**
International

2nd Annual
*Broadband Leaders
Retreat*

The Industry's Only Networking Event for Broadband Engineering Professionals.

For consideration, please call 301-340-7788, ext. 2004

Who?

Top MSO/Broadband
Engineering Professionals

What?

Exclusive, non-agenda
weekend of relaxing golf,

When?

March 2-4, 2001

Where?

Pointe Tapatio
Cliffs Resort,
Phoenix, AZ

DAX SECURITY ENHANCEMENT

Telect has enhanced its StarDAX-11 digital access cross with the Circuit Redundancy System, which provides additional network performance security. The system has an automatic in-system backup, a fail-safe switch,

advanced cooling features and occupies three rack units of vertical space.

For more information, contact Telect at (800) 551-4567 or on the Web at www.telect.com

BLIND-MATE CONNECTORS

The Micro-Fit 3.0 blind mate interface connector system from Molex has a screwless mounting design and fast assembly. The device has a funnel-shaped entry that guides mating receptacles, incorporates features found in large power connectors and locks connectors into place allowing it to float inside the



panel up to .05 inches in any direction. The connector system is intended for PC power supplies, servers and routers, and can carry up to five amps of current per circuit.

For more information, contact Molex at (800) 78-MOLEX or on the Web at www.molex.com.

TELESCOPIC/ARTICULATING PLATFORM

Elliot Equipment's 41-foot telescopic/articulating workplatform has a large bucket and wide side reach. The ECA-41 workplatform has a 46-



foot working height, a 29-foot working side reach, and a design that allows for operation over obstacles. The unit sits on a 17,500 lb. chassis and requires no commercial driver's license.

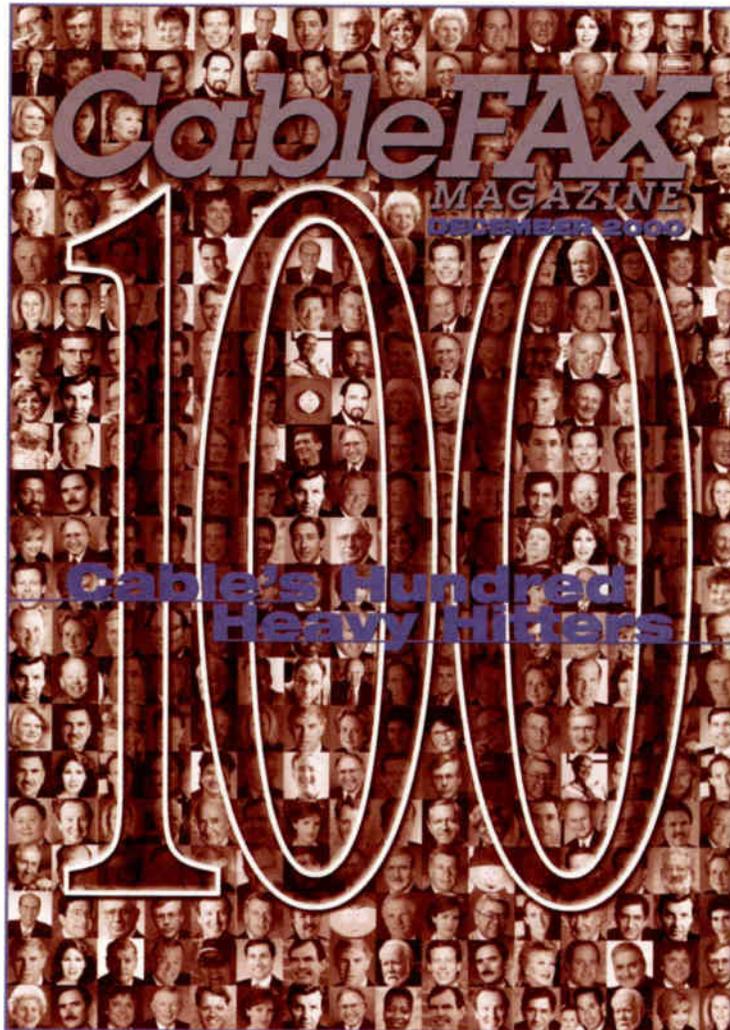
For more information, contact Elliot Equipment at (402) 592-4500 or on the Web at www.elliottequip.com.

WHEN IT COMES TO PREPARING CABLE, CABLEMATIC® IS PREPARED FOR EVERYTHING.

Cablematic® serves the CATV and Telecommunication industries offering a complete line of tools. Cablematic® tools and accessories are used on trunk, distribution, drop, messenger, and fiber optic cables. The Ripley Company, with its worldwide stocking distribution network, is your best single source for cable preparation tools. Contact us for more information.

Cablematic
RIPLEY COMPANY

46 Nooks Hill Road, Cromwell, CT 06416 USA
Phone: 800-528-8665 Int'l: (01) 860-635-2200 Fax: (01) 860-635-3631
www.ripley-tools.com



will**YOU**be in?

nominations, artwork and bribes: seth arenstein sarenstein@phillips.com
& marc osgoode smith MOSmith1@aol.com

advertising: nancy maynard 301.340.7788 x4570

FIBER PLATFORM EXTENSION

ADVA Optical Networking's Fiber Service Platform-I and -II supports the geographically dispersed parallel sysplex (GDPS) networking architecture Coupling Link. ADVA's

FSP-I system can multiplex up to eight GDPS connections over a single pair of fibers using dense wave division multiplexing (DWDM), and FSP-II can support up to 32 GDPS

connections. Data centers can combine a virtual supercomputer when combining ADVA FSP-I or -II platforms with geographically dispersed servers.

For more information, contact ADVA at www.advaoptical.com.

MULTI-CHANNEL RACEWAY

Elliptically shaped InfoStream multi-channel raceway, produced by **HellermannTyton**, has up to four channels for electrical, voice, data, video or fiber optic cable installation. The InfoStream hinged cover can be partially mounted prior to laying cables, and all the system's fittings have the 1-inch required minimum bend radius.



For more information, contact HellermannTyton at (800) 822-4352, or on the Web at www.hellermann.tyton.com.

REVISED OTDR SOFTWARE

GN Nettest's latest software revision of Version 3.0 of the Model 7500 optical time domain reflectometer (OTDR) increases measurement speed of high fiber count cables. Model 7500's capacity as OTDR and optical channel analyzer (OCA) makes it applicable for provisioning and maintaining dense wave-length division multiplexing (DWDM).

For more information, contact GN Nettest at (315) 266-5051 or on the Web at www.gnnettest.com.

What do more than 750 of the largest Cable Operators, and now the NCTC, know about the "SUB-ALERT" Emergency Alert System

Compatible With All IF, 4.5 MHz Baseband and Comb Generator Switching

Less Rack Space

Substantially Fewer Cables & Connections

Longest Warranty

No Ad Insertion Crashes

Simple, Easy, User Friendly Operation

Can Be Completely Balanced w/o Disconnecting any Cables

Substantially Fewer Components

NO Computers or controllers Required

6 Monitoring Inputs

Ease of Installation

Highest Technical Specifications in the Industry

Selective Channel Switching By Event

Elimination of NOAA 1050 Hz Tone

Low Cost

Crawl EAS Alerts Over Program Video w/o a Computer

Local Franchise Compliance w/ Audio Only or Audio and Video

3 EAS Display Modes

Automated Weekly Tests on All or the Details Channels Only

Telephone Access w/Voice Response and Time-Out Feature

No Bandwidth Limitations

Red, Green, Yellow Alerts

Non Interfering

Remote Hub Site Control

Upgrade to Crawls for EAS, Cross Channel Promotions & Announcements

The National Cable Television Co-op Hardware Committee has chosen MHz and the "Sub-Alert" as the preferred EAS Vendor Solution

Don't Be Fooled All EAS Systems are not created equal!

MHz
MEGA HERTZ
Established 1975

800-922-9200
www.megahz.com • engineering@megahz.com

"Unique" Products For the 21st Century!

Oregon, Arizona, Colorado, Texas, Missouri, Ohio, Pennsylvania, Georgia, Florida, New Hampshire



Emerging**Technologies**

Explore the Possibilities

"By attending this conference, you'll walk away with the winning playbook for the big game to be played three years from now in our industry. You'll gain an insider's look into the tactics and technologies that will form the next generation of digital networks and software systems."

Jim Ludington, President,
INT2-Internetwork
Integration

By attending SCTE's Conference on Emerging Technologies, you'll:

- Connect with 1,000 industry visionaries and leaders.
- Gain a competitive advantage armed with a vision of the future.
- Position your company to take advantage of up-and-coming opportunities.
- Shape the future rather than react to it.

January 8-10, 2001 • New Orleans

**Register today at www.scte.org
or call 800-542-5040.**

CABLE RACK SPACERS

Panduit's stackable cable rack spacers eliminate pinch points that can occur with heavy cable bundles and cause signal distortion. The spacers mount to any ladder rack by standard nylon ties and can be stacked up to five high. They are offered in both 1-

position and 6-position styles and can accommodate bundles up to 0.8 inches in diameter.

For more information, contact Panduit at (888) 506-5400 or on the Web at www.panduit.com.

DWDM EXPANSION

Lightchip's 48-channel drop-in card allows for dense wave division multiplex-

ing (DWDM) systems expansions and can be configured to the customer's specific chassis requirements. The 48 C-Band channel card has an ultra low-insertion loss that minimizes the need for optical amplifiers and are also bi-directional, which eliminates the need for second fiber span or additional end ports. The module can be installed in a stand-alone system or integrated into an existing long-haul system.

For more information, contact Lightchip at (603) 894-7165 or on the Web at www.lightchip.com.



UTILITY DRILL

BoreMaker motors, produced by Intedyn, are able to drill in hard formations with smaller rigs because of its higher torque and lower flow rates. The positive displacement motors derive their proprietary power sections that deliver power through a patented, sealed assembly, which reduces pressure across the tool.

For more information, contact Intedyn at (888) 820-3535 or on the Web at www.intedyn.com.



Yesterday's products cannot protect your investment in today's advanced in-house networks



MODEL SV-GB-1G
(Patented)

- All Brass Construction
- Ground Surface Contact >.500"
- Return Loss 35 dB Minimum

Signal Vision's New 1-GHz Bonding Block

Manufactured of materials that are recommended by the N.E.C. and are galvanically compatible to interface with ground wire (copper), and 'F' fittings (brass). **Utilizes an innovative split-bolt type of ground wire contact.**

27002 Vista Terrace, Lake Forest, CA 92630
(949) 586-3196 FAX (949) 586-3952



Connect

to a stronger career — **Join SCTE!**

Joining more than 17,500 members worldwide, you'll surround yourself with success and gain access to:

Training & Education

•

Problem-Solving Resources

•

Networking Forums

•

News & Knowledge Publications

•

Awards & Recognition

•

Leadership Opportunities

•

Scholarships

•

Career-boosting Certification Programs



Join today at www.scte.org!



Society of Cable
Telecommunications
Engineers

MARKETPLACE

SPECIALIZED PRODUCTS CATALOG

Specialized Products' 400-page Fall 2000 catalog includes 200 additional items. Technicians, field service managers and engineers can choose from over 100 standard tool kits, hand tools and electronic test equipment including component testers, digital multimeters, fre-



quency counters, function generators, oscilloscopes, power supplies and instrument/shipping cases.

For more information, contact Specialized Products at (800) 866-5353 or on the Web at www.specialized.net.

OSCILLOSCOPE PLATFORM

LeCroy's WavePro oscilloscope platform incorporates "digitizer on a chip" technology that improves sampling rate and memory performance in the 500 MHz to 2.0 GHz bandwidth range. The oscilloscopes also incorporate LeCroy's WavePilot, which offers shortcuts to quick measurements, analytic graphing displays, and user-application customization. The series comes in three types, which range from 500 MHz to 1 GHz in bandwidth scope, and 4 GS/s (Giga samples/second) per channel to 16 GS/s on single signal mode. The WavePro's acquisition memory is 250 kilopoints (kpts).

For more information, contact LeCroy at (914) 425-2000 or on the Web at www.lecroy.com.

MARKER SYSTEM

Radiodetection's Intelligent Marker System aids in storing and retrieving field information on site. Radiodetection's lightweight handheld unit reads and writes information on markers which are secured to utility poles and posts. The markers are small and

brightly colored, and allow both pre-recorded and free-form messages. Recorded data can be uploaded to a personal computer (PC).

For more information, contact Radiodetection at (800) 524-1739 or on the Web at www.radiodetection.com.

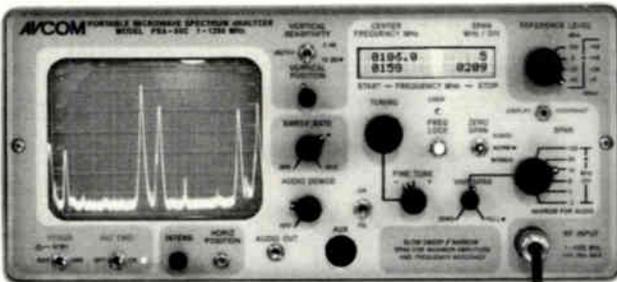
NEW MULTIFUNCTION LCD

AVCOM's PSA-65C Portable Spectrum Analyzer

Microprocessor Controlled, 1-1250MHz In One Sweep!

AVCOM's newest Portable Microwave Spectrum Analyzer, model PSA-65C, incorporates a microprocessor and attractive multifunction, backlit LCD, with an expanded frequency range from less than 1MHz to over 1250MHz, for the amazing price of \$ 2930.

AVCOM's new PSA-65C is a low cost general purpose spectrum analyzer that's loaded with standard features including FM audio demodulator, AM detector and digital frequency lock. The PSA-65C covers frequencies thru 1250 MHz in one sweep with a sensitivity greater than -95 dBm at narrow spans. The PSA-65C is ideally suited for 2-way radio, cellular, cable, satellite, LAN, surveillance, educational, production and R&D work. Options include new 1250 MHz frequency extenders, BNG-1000A tracking (noise) generator, log periodic antennas, carrying case (AVSAC), and more.



Visit our web-site at www.AVCOMofVA.com.

AVCOM

500 SOUTHLAKE BOULEVARD
RICHMOND, VA 23236 USA
804-794-2500 FAX: 804-794-8284

Phone, fax or write for more information or to order.

日本製のスプライサーをお使いですか？

Have you been splicing in JAPANESE all this time?
Try the **AMERICAN WAY** of fiber splicing.
The new **AURORA FUSION 3000!**



- Faster PAS**
- More accurate**
- More rugged**
- More reliable**
- Less expensive**

So, what are you waiting for?

NEW
See our new line of
handheld fiber optic
test instruments.

Aurora Instruments, Inc.

124 South Maple St.
Ambler, PA 19002
Tel: 1-215-646-4636

Fax: 1-215-646-4721
e-mail: aurorasplit@aol.com
www.aurora-instruments.com

SURFACE MOUNT LEDs



Lumex Inc.'s surface mount technology (SMT) light emitting diodes (LEDs) feature a built-in domed lens on top of a flat-bottomed carrier. Lumex LEDs focus the light to a 50-degree angle of emission, vs. a conventional angle of 130 to 180 degrees. These LEDs are designed for display or backlighting applications, as well as status or circuit fault indicators.

For more information, contact Lumex at (800) 278-5666 or on the Web at www.lumex.com.

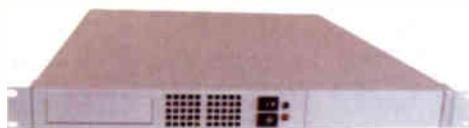
LOW-PROFILE, LOW-COST SERVERS

ITOX Inc.'s Little Dragon series of server appliances support Intel Pentium III processors up to 700 MHz and Intel Celeron processors. The series initial offerings include 1U and 2U units, in barebone or full system configurations.

The 1U design (1.75 inches high) includes one full-length peripheral component interconnect (PCI) slot and three drive bays. The 2U design (3.5 inches high) includes two full-length PCI slots and four drive bays.

ITOX says its prices are up to 50 percent below competitive products.

For more information, contact ITOX at (732) 390-2815 or on the Web at www.itox.com.



Little Dragon 1U



Little Dragon 2U

New & Pre-Owned Test Equipment

- ◆ Spectrum Analyzers
- ◆ Signal Level Meters
- ◆ Oscilloscopes

The AVCOM PSA-37D Portable Spectrum Analyzer is the answer to all your downlink installation, service and maintenance problems. Complete digital readout, this analyzer spans from 10 - 1750 MHz and 3.7 to 4.2 GHz. It includes built-in DC block with +12/18 VDC for powering LNAs and BDC's, calibrated signal strength amplitude display, and an internal battery with charger. Selectable vertical sensitivity of either 2 dB or 10 dB/div is standard. Available in 220/240V models, the PSA-37D Spectrum Analyzer is ideal for field test situations and is the perfect instrument for the critical alignment and tracking measurements necessary for maximum signal reception.



- ◆ Frequency coverage from 10 to 1750 MHz and from 3.7 to 4.2 GHz, in 5 bands
- ◆ Accurate 4-digit LCD frequency readout
- ◆ Ku and C band compatible
- ◆ Built-in DC block and power for LNAs and LNBs

Sale Price: \$2,395.00
(Includes AVSAC Carrying Case)

The AVCOM PSA-33A Portable Spectrum Analyzer is similar to the PSA-37D above, but the frequency range extends from 1-2100 MHz. Affordably priced at \$2,775.00.

For detailed information and specifications, see www.testequipmentdepot.com



The Leader LF942A Satellite Signal Level Meter measures the signal level output of satellite LNBs (down converters) and carrier-to-noise ratio. Fully portable and battery operated, the unit also powers the LNB allowing independent assessment of the dish/LNB part of the installation.

The Leader LF941 TV/CATV Signal Level Meter can measure signal levels and broadcast VHF/UHF as well as standard cable channels in the U.S. and 7 other countries.

- ◆ Signal Level & Power of Satellite LNBs (LF 942A)
- ◆ TV/CATV Coverage: from 46-870 MHz (LF 941)
- ◆ Small, fully-portable, & battery-operated

Sale Price: \$489.00 (LF941)
Sale Price: \$749.00 (LF942A)

www.testequipmentdepot.com Test Equipment Depot
e-mail: sales@testequipmentdepot.com 99 Washington St. Melrose, MA
Toll Free 1-800-996-3837 (781) 665-1400 • FAX (781) 665-0780



Henry Ford, inventor of the first American automobile, the Model T, was credited with revolutionizing factory production with his assembly-line methods. His work plunged America into the industrial revolution.

get the credit you deserve!

Receive College Credit for NCTI Courses!

- CATV System Overview
- Installer
- Digital Installer
- Installer Technician
- Service Technician
- System Technician
- Fiber Optic Technician
- Advanced Technician
- Effective Supervision
- Principles of Management



Your Broadband Communications Training Partner

303.797.9393 • www.ncti.com
801 W. Mineral Ave., Littleton, CO 80120

www.cabletoday.com

INTERACTIVE TV PLATFORM

WorldGate Communications' CableWare 2000 is an open-standard middleware platform geared for the current generation of digital set-top boxes. The architecture is optimized for a small memory footprint and low central processing unit (CPU) use. The middleware will enable the current 2000-class of digital set-tops to host a majority of the applications that have been targeted for next-generation advanced boxes. It includes a compatibil-

ity interface to WorldGate's Application Launcher software (WALI), which brings a base of native applications to CableWare-enabled digital converters.

The platform includes a software developer's kit (SDK) and a content development kit (CDK), which give operators flexibility in choosing application offerings.

For more information, contact WorldGate at (215) 354-5100 or on the Web at www.wgate.com.

VERSATILE CABINETS

Equipto Electronics' Heavy Duty line cabinets enable engineers to change constraints without changing cabinet designs. The line meets requirements for earthquake protection, dust-proofing, shock and vibration, EMI/RFI, FCC/VDE, EMP/TEMPEST, metric and others. The line features both standard and customized designs. Certain models are available through Equipto's five-day shipping.

For more information, contact Equipto at (804) 204-RACK or on the Web at www.equiptoelec.com.



POF MODEM

Aftabyte's Model 3340 plastic optic fiber (POF) Modem communicates serial data over short distances through hostile environments. The device is the first to provide RS-232 based data transmission over POF cable at 256 Kbps.



Model 3340 has reliable operation up to 100 meters and does so by encoding the RS-232 data before transmitting on the POF cable. The signal is decoded and restored at the receiver to the original transmission. The device comes with a 10-foot DB9 extension cable.

For more information, contact Aftabyte at (954) 935-9091 or on the Web at www.aftabyte.com.

FIBER CABLES

Ruggedized fiber optic cable is available in single and double jacket configurations from **Chromatic Technologies**.

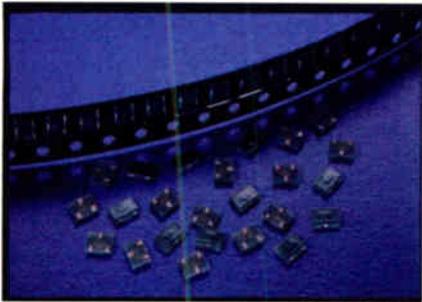
The cables are flexible with an abrasion-resistant polyurethane outer jacket and are approved by the Army Communications and Electronics Command (CECOM). Sizes offered range from 4.75mm to 7.49mm outer diameter, and cable compatibility includes most military style multi-channel connectors.



For more information, contact Chromatic Technologies at (888) 541-7100 or on the Web at www.drakausa.com.

ESD SUPPRESSOR

Littelfuse's PulseGuard line of ElectroStatic Discharge (ESD) suppressors includes a two-line device based on the SOT23 configuration. The PGB002ST23 protects input and output lines of computers, consumer electronics and wireless communications against ESD overvoltages and offers low leakage current and low capacitance. The device minimizes personal computer (PC) board trace lengths and interconnections, and land space usage.



For more information, contact Littelfuse at (800) 999-9445 or on the Web at www.littelfuse.com.

AV-1 SERIES REELS



Hannay AV-1 series reels are stackable for maximum storage and transport efficiency. The reels,

designed for broadcast applications, have welded channels and are constructed of non-reflective, matte finish steel. The units have a side mounted connector panel that is removable and allows for customization of connector patterns.

For more information, contact Hannay Reels at (877) GO-REELS or on the Web at www.hannay.com.

BTSC Stereo Generators



MTS-2B

"Call us for all your BTSC stereo requirements"!

800-922-9200

www.megahz.com • engineering@megahz.com

MHz
MEGA HERTZ
Established 1975

STOCKS



"Unique" Products For the 21st Century!

Oregon, Arizona, Colorado, Texas, Missouri, Ohio, Pennsylvania, Georgia, Florida, New Hampshire

SUBSCRIBING TO COMMUNICATIONS TECHNOLOGY IS EASY!

- 1 **Send an e-mail to CT.SUB@REPLY.NET**
A subscription form will be sent to you via e-mail. Fill out and e-mail back.
- 2 **Call (800) 777-5006.**
Speak to one of our customer service representatives, who will take all your information over the phone.
- 3 **Mail your request to:**
Communications Technology Magazine
1201 Seven Locks Road
Potomac, MD 20854
Attention: Circulation Department—New Subscriptions

FOR CHANGES OF ADDRESS

- 1 **Send a fax to (847) 291-4816.**
Please include a copy of the mailing label and the corrected address.
- 2 **Call (800) 777-5006.**
Speak to one of our customer service representatives, who will take all your information over the phone.
- 3 **Mail your request to:**
Communications Technology Magazine
1201 Seven Locks Road
Potomac, MD 20854
Attention: Circulation Department—Address Corrections

WE THANK YOU FOR YOUR INTEREST IN COMMUNICATIONS TECHNOLOGY AND HOPE TO CONTINUE SERVING YOU IN THE FUTURE.

IMMCO



IMMCO, Inc.

Your Partner in Quality and on Time Delivery for
Walkout, Strand Drafting, RF & Fiber Design.

770.416.8835 - Norcross, Georgia - www.immcoinc.com

IMMCO, Inc.



IMMCO

WEBCONNECT

| Advertiser | Web Address |
|--|--|
| Alpha Technologies | www.alpha.com |
| AML Wireless | www.amlwireless.com |
| Antec Network Technologies | www.antec.com |
| ANTEC TeleWire Supply | www.telewiresupply.com |
| Aurora Instruments | www.aurora-instruments.com |
| Avcom | www.avcomofva.com |
| Barco | www.barco.com |
| Best Data | www.bestdata.com |
| Blonder Tongue | www.blondertongue.com |
| Broadband Access Systems | www.basystems.com |
| Broadband Services Inc | www.broadbandsvc.com |
| C-COR.net | www.c-cor.net |
| Cable AML | www.cableaml.com |
| Cable Innovations | www.cableinnovations.com |
| Cable Leakage | www.wavetracker.com |
| Cable Prep | www.cableprep.com |
| Cable Resources Inc | www.cricabletv.com |
| Canal+ Technologies | www.canalplus-technologies.com |
| Channell | www.channellcomm.com |
| Cheetah Technologies | www.cheetahtech.com |
| CIS Inc | www.cisfocus.com |
| Commscope | www.commscope.com |
| Comsonics | www.comsonics.com |
| Core Networks | www.corenetworks.com |
| Corning Cable Systems | www.corningcablesystems.com |
| CosmoCom | www.cosmocom.com |
| Digitrans | www.digitransusa.com |
| Diva Systems | www.divatv.com |
| Dura-Line Corporation | www.duraline.com |
| Electroline | www.electrolinequip.com |
| Engineering Unlimited | www.sterlingpadlocks.com |
| Fiber Instrument Sales | www.fisfiber.com |
| Fiber Optic Network Solutions | www.fons.com |
| Harmonic | www.harmonicinc.com |
| HUKK Engineering | www.hukk.com |
| IMAKE | www.imake.com |
| IMMCO | www.immcoinc.com |
| Invensys Energy Systems North America | www.lectro.com |
| Ipitek | www.ipitek.com |
| Klungness Electronic Supply | www.ccikes.com |
| Leader Instruments | www.leaderUSA.com |
| Lindsay Electronics | www.lindsayelec.com |
| Lode Data | www.lodedata.com |
| Lucent Technologies | www.lucent.com/cableconnect |
| Mainline Equipment | www.mle.com |
| Mega Hertz | www.megahz.com |
| MK Battery | www.mkbattery.com |
| Monroe Electronics | www.monroe-electronics.com |
| Moore Diversified Products | www.mooreDPC.com |
| Motorola Broadband Communications Sector | www.motorola.com/broadband |
| Multilink | www.multilinkinc.com |
| NCTI | www.ncti.com |
| Noise/Com | www.noise.com |
| Norscan | www.norscan.com |
| Oldcastle | www.oldcastlecomm.com |
| Passive Devices | www.pdi-efi.com |
| PCI Technologies | www.pci.com |
| Pico Macom | www.piconet.com |
| Power & Telephone Supply | www.ptsupply.com |
| Prefomed Line Products | www.prefomed.com |
| Quality RF Services | www.qrf.com |
| Quintech | www.qecinc.com |
| R. L. Drake | www.rldrake.com |
| Rifocs Corporation | www.rifocs.com |
| Ripley Company | www.ripley-tools.com |
| Riser Bond Instruments | www.riserbond.com |
| RiverDelta Networks | www.riverdelta.com |
| Sadelco | www.sadelco.com |
| SCTE | www.scte.org |
| SeaChange | www.schange.com |
| Signal Vision | not available |
| Sprint North Supply | www.sprintnorthsupply.com |
| Standard Communications | www.standardcomm.com |
| Teccor | www.teccor.com |
| Telecrafter Products | www.telecrafterproducts.com |
| Tempo Research | www.tempocomm.com |
| Terayon Communication Systems | www.terayon.com |
| Test Equipment Depot | www.testequipmentdepot.com |
| Times Fiber Communications | www.timesfiber.com |
| Toshiba | www.internet.toshiba.com |
| Trilithic | www.trilithic.com |
| Tulsat | www.tulsat.com |
| TVC | www.tvcinc.com |
| Tyco Electronics | www.tycoelectronics.com |
| Viewsonics | www.viewsonics.com |
| Watkins-Johnson | www.wj.com |
| WaveCom Electronics | www.WaveCom.ca |
| Wavetek Wandel Goltermann | www.wvgolutions.com |

Hosted by
Communications Technology **Communications Technology**
International

2nd Annual
*Broadband Leaders
Retreat*

The Industry's Only Networking Event for Broadband Engineering Professionals.

For consideration, please call 301-340-7788, ext. 2004

Who?

Top MSO/Broadband
Engineering Professionals
and their spouses

What?

Exclusive, non-agenda
weekend of relaxing golf,
spa, food & fun

When?

March 2-4, 2001

Where?

Pointe Tapatio
Cliffs Resort,
Phoenix, AZ

ADVERTISER ACCESS

| Advertiser | Page # |
|---------------------------------------|----------|
| Alpha Technologies | 5 |
| AML Wireless | 54 |
| Antec Network Technologies | 89 |
| ANTEC TeleWire Supply | 9 |
| Aurora Instruments | 156 |
| Avcom | 156 |
| Barco | 30-31 |
| Best Data | 128 |
| Blonder Tongue | 93 |
| Broadband 2000 | 147 |
| Broadband Access Systems | 53 |
| Broadband Leaders Retreat | 149, 161 |
| Broadband Services Inc. | 56-57 |
| C-COR.net | 45 |
| Cable AML | 26 |
| Cable Innovations | 112 |
| Cable Leakage | 27 |
| Cable Prep | 91 |
| Cable Resources Inc. | 139 |
| Cable Today | 158, 173 |
| Cable Today | 175, 177 |
| CableFAX | 151 |
| Canal+ Technologies | 103 |
| Channell | 102 |
| Cheetah Technologies | 2-3 |
| CIS Inc | 125 |
| Commscope | 111 |
| Comsonics | 13 |
| Core Networks | 143 |
| Corning Cable Systems | 117 |
| CosmoCom | 67 |
| Digitrans | 17 |
| Diva Systems | 47 |
| Dura-Line Corporation | 28 |
| DX Communications | 23 |
| Electroline | 179 |
| Engineering Unlimited | 46 |
| Fiber Instrument Sales | 10 |
| Fiber Optic Network Solutions | 55 |
| Harmonic | 63 |
| HUKK Engineering | 19, 97 |
| IMAKE | 101 |
| IMMCO | 160 |
| Invensys Energy Systems North America | Insert |
| Ipitek | 39 |
| Klungness Electronic Supply | 88 |
| Leader Instruments | 135 |
| Lindsay Electronics | 52 |
| Lode Data | 138 |
| Lucent Technologies | 36-37 |

| Advertiser | Page # |
|--|---------------|
| Mainline Equipment | 127 |
| Mega Hertz | 28, 40, 62 |
| Mega Hertz | 68, 92, 120 |
| Mega Hertz | 142, 148, 152 |
| Mega Hertz | 159, 176 |
| MK Battery | 61 |
| Monroe Electronics | 142 |
| Moore Diversified Products | 99 |
| Motorola Broadband Communications Sector | 80-81 |
| Multilink | 180 |
| NCTI | 157 |
| Noise/Com | 129 |
| Norscan | 140 |
| Oldcastle | 137 |
| Passive Devices | 25 |
| PBI Customer Service | 159 |
| PBI List Sales | 176 |
| PCI Technologies | 79 |
| Pico Macom | 113 |
| Power & Telephone Supply | 141 |
| Preformed Line Products | 105 |
| Quality RF Services | 73 |
| Quintech | 100 |
| R. L. Drake | 87 |
| Rifocs Corporation | 92 |
| Ripley Company | 150 |
| Riser Bond Instruments | 41 |
| RiverDelta Networks | 77 |
| Sadelco | 116 |
| SCTE | 35, 153, 155 |
| SeaChange | 69 |
| Signal Vision | 154 |
| Sprint North Supply | 109 |
| Standard Communications | 11 |
| Teccor | 126 |
| Telecrafter Products | 8, 14 |
| Tempo Research | 118 |
| Terayon Communication Systems | 7 |
| Test Equipment Depot | 157 |
| Times Fiber Communications | 107 |
| Toshiba | 21 |
| Trilithic | 33, 71, 133 |
| Tulsat | 51, 145 |
| TVC | 70 |
| TVC | 72 |
| Tyco Electronics | 121 |
| Viewsonics | 29 |
| Watkins-Johnson | 85 |
| WaveCom Electronics | 90 |
| Wavetek Wandel Goltermann | 15, 119 |

the inside track on convergence

The definitive new broadband event

October 30 – November 1 2000

Palais des Congres, Paris

UNIQUE NEW INSIGHTS

- Conference and exhibition for senior executives and technologists across every platform
- Organised by Phillips Business Information - whose central role in the industry means delivery of the best speakers, key decision makers and true visionaries at the cutting edge of broadband development
- They will be sharing their inside knowledge to bring vital new insights – helping you to succeed

EXCITING NEW INTERACTIVE FORMAT

Moderated panel debates for genuine participation and three specialist breakout tracks providing in-depth insight into the total broadband picture...

Conference plenary

Identifying the future winners and losers amongst platforms and applications

Track 1 – Broadband Delivery 2000

Spotlighting the real opportunities in broadband delivery

Track 2 – Digital TV 2000

Share the pioneers vision of home technology

Track 3 – Multimedia Via Satellite 2000

Succeeding through point-to-multipoint transmission

Exhibition and free Technology Deployment Forum

Showcasing the technological developments of the future

THE FINAL WORD ON BROADBAND

The industry's answer to the questions the industry wants answered

For further information or to register for either the conference or exhibition, call +44 (0) 20 7423 4549 www.cabletoday.com/broadband2000

Special discounted Earlybird offers available for those booking before September 30th 2000



BROADBAND2000

LINEAR AMPLIFIER

A 24-volt amplifier with low distortion and noise figure is available from **Anadigics**. The ACA2401S7 targets the 870 MHz cable TV systems and is designed for broadband cable systems including fiber nodes, head-ends, line expanders, and system amplifiers. It consists of two pairs of parallel amplifiers, which give flat gain and are designed for advanced services and additional bandwidth in networks. The device has 21.5 dB gain, 18 dB minimum return loss and a 4.5 dB maximum noise figure.

For more information, contact Anadigics at (908) 668-5000 or on the Web at www.anadigics.com.

INTERNET TELECONFERENCING

Spectel has announced the availability of its wireless Internet-accessible audio and data conference system. Confertel 7000 is aimed at the global corporate market and has integrated reservation management, Web portal

capability, credit-card validation and carrier-grade billing.

For more information, contact Spectel at (888) 712-9785 or on the Web at www.spectelglobal.com.

COMMUNICATIONS INTERFACE

Radstone's communication-oriented board, the EP1A-8240, integrates serial channels and a Military Standard-1553B communications interface. The device is the latest board in 6U and public mobile carrier form factor to emerge from the company, and is targeted at deeply embedded applications, especially those that require high-speed communication functionality. The EP1A-8240 has five ruggedization levels for both the industrial and mili-

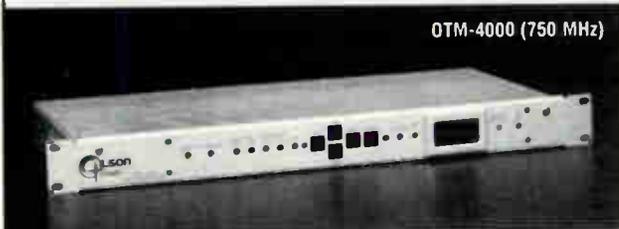
tary/aerospace markets.

For more information, contact Radstone Technology at (800) 368-2738 or on the Web at www.radstone.com.



OLSON TECHNOLOGY, INC. HAS A NEW MODULATOR, AND MEGA HERTZ HAS THEM IN STOCK.

OTM-4000 (750 MHz)



THE OTM-4000 (750 MHz) FREQUENCY AGILE MODULATOR HAS:

- Agility to 750 MHz
- >80 dB Out of Band C/N Ratio
- LCD Menu Screen
- Channel and Channel ID Text
- 60 dBmV Output Across the Band
- Micro-Processor Controlled Push Button Tuning

MHZ
MEGA HERTZ®
Established 1975

OLSON TECHNOLOGY INCORPORATED

Why Pay \$2,200 for a Modulator when much less will deliver the quality picture you need for your system?

**Call Mega Hertz Today and Save...
800-922-9200**

www.megahz.com • engineering@megahz.com

"Unique" Products For the 21st Century!

Oregon, Arizona, Colorado, Texas, Missouri, Ohio, Pennsylvania, Georgia, Florida, New Hampshire

RETURN ALIGNMENT

NEW
5112-6



Carrier Generators • Signal Level Meters • RF Switches
Spectrum Analyzers • Return Alignment Systems

C A T V 6-CARRIER GENERATOR MODEL 5112-6

6-Carrier Signal Generator for Return Path Tests

- Frequencies: Specify any 6 freqs between 5–65 MHz (T-chans are popular: 7, 13, 19, 25, 31, 37 MHz)
Higher freqs also available: 5–860 MHz
- Amplitude: +55 dBmV, std. (Higher outputs available)
- Spurious: 60 dBc std. (>70 dBc available)
- Size: (W x H x D): 7.25" x 4" x 10"; 8 lbs.
- Battery: Rechargeable NiCad, >8 hours continuous use
- Front Panel Controls: Individual carrier on/off, or all simul.
Individual linear amplitude adjust -13 dB
70 dB step attenuator in 10 dB steps

TEL: 317-782-4331 • FAX: 317-786-9665

<http://www.appliedin.com>

Toll Free in USA: 800-244-2976

APPLIED INSTRUMENTS, INC.

ADAMS GLOBAL COMMUNICATIONS

*We buy and sell excess cable equipment!
We provide quality service!*

(800) 451-1762 □ (913) 764-7280 □ (913) 764-0540 fax

www.adamsglobal.com

email: madams@adamsglobal.com



*Serving the telecommunications industry
with over 20 years of design experience.*

- ▶ Rebuilds
- ▶ Upgrades
- ▶ Extensions
- ▶ Lode Data
- ▶ AutoCAD

P.O. Box 542 Lapel, IN 46051

765-534-4912

E-mail: info@bbandservices.com www.bbandservices.com

Specialists in HFC network design

WWW.CATVSERVICES.COM

Excess Material
Solutions

New & Used
Equipment
Sales

Onsite Material
Specialist



800-227-1200

305-474-0409 / 305-474-0947 fax

Headend Filters

- Notch Filters with Passbands up to 1 GHz
- Highly Selective Bandpass Filters
- Waveguide Filters to 50 GHz
- C-Band TVRO & Radar Interference Filters



**MICROWAVE
FILTER COMPANY**

800-448-1666 • 315-438-4700
Fax: 315-463-1467
Toll Free Fax: 888-411-8860
<http://www.microwavefilter.com>
E-Mail: mfcsales@microwavefilter.com



CABLE CONSTRUCTORS, INC.

COMPLETE TURNKEY CONSTRUCTION 1-800-338-9299

- Coaxial and Fiber
- Mapping and Design
- Member SCTE
- Splicing and Activation
- Fusion Splicing
- Aerial, Underground & Fiber Construction
- Material Supply
- Emergency Fiber Restoration
- System Sweep
- Proof of Performance
- Turnkey Headend
- Complete Turnkey Project Management

quality service performed on a timely basis

E-MAIL cci@cableconstructors.com • <http://www.cableconstructors.com>

Career Opportunities available. Call 800-338-9299 ext. 199

Quality Cable & Electronics, Inc.

www.qualitycable.com



Tel: (954) 978-8845 Fax: (954) 978-8831
Worldwide Distributor
(800) 978-8845

Fiber Optics Cable Headend Line Equipment Drop Material

ComSer-Co., Inc.

For All Your Cable Needs
Communications supplies and service
CATV Specialist

We Buy & Sell CATV Equipment
Surplus, New, RMP & Used Line Gear, Taps, Connectors, Misc.
Serving the Cable Industry Since 1984

the
Communication
Services
Company

Ph. (800) 391-1412

Ph. (719) 481-1350

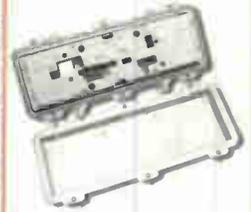
Fax. (719) 481-1352

email: info@ComSer-co.com • web: www.ComSer-co.com

Surplus Equipment - New & Remanufactured

Converters
Headend Gear
Test Equipment
Line Gear
Fiber Optics
Hardware

Converters in Stock:
SA • GI
Pioneer • Zenith



SA • Jerrold • Magnavox • Zenith • GI • C-Cor

SPECIALS

- SA 750mhz GaAs FET LEIII #574754
- 750mhz C-Cor Amplifiers
- Hardware
- Alpha XM Series 60v Power Supplies
- New Taps & Passives
- Cable and Pedestals



Tel (760) 631-2324

Fax (760) 631-1184

(800) 397-8897

www.jonesbroadband.com

email: jonesbbi@jonesbroadband.com

Oceanside, CA 92056

White Sands

"Since 1978"

"We've got connections"

1-800 Jumpers (586-7377)

CUSTOM MADE CABLE ASSEMBLIES INCLUDING:

F to F, N to N, BNC, RCA, F-81

Gilbert
PPC
T&B
Off Shore
Digicon

RG-11
RG-56
RG-59
RG-213
RG-214

Comm/Scope
Belden
Times
Quabbin

Fax: (623) 582-2915 Phone: (623) 581-0331
21615 N. 27th Avenue - Phoenix, AZ 85027 USA

PTL Test Equipment, Inc.

BUY-SELL-LEASE-TRADE

• HP, Tektronix, Wavetek, Trilithic,
Calan, Matrix, Sencore, Modulation Sciences,
Sicor, Laser Precision, etc. •

Ph: (561) 747-3647 <http://www.PTLTEST.com>

Fax: (561) 575-4635 Email: PTLTE@aol.com

NEW AND RECONDITIONED

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.

RF & IF

Solutions starting under \$5,000

Idea/ONICS

The Pioneers in Emergency Alert Systems

(701) 786-3904

Fax: (701) 786-4294

**Communications
Technology**

WHERE IT'S AT!!

CALL 1-800-325-0156,

extension 23

for your Classified Advertising

KES

KLUNGNESS ELECTRONIC SUPPLY

1-800-338-9292

HEADEND

AERIAL

UNDERGROUND

CABLE/CONNECTORS

DISTRIBUTION

DROP

SUBSCRIBER

TOOLS & EQUIPMENT

TEST

Knowledge, Experience, Service
Check our specials on the web at:
www.ccikes.com

Or contact us at: kes@ccikes.com

A subsidiary of Cable Constructors, Inc.

 us out on the **WEB!**
www.cabletechnologies.com

BUY • SELL • TRADE • REPAIR • UPGRADE • BUY • SELL

**MAIN LINE
EQUIPMENT INC.**

WE BUY, SELL, AND REFURBISH
PRE-OWNED LINE GEAR, CONVERTERS,
PASSIVES AND FIBEROPTIC EQUIPMENT

WE STOCK NEW, ACTIVE ELECTRONICS AND PASSIVES
SCIENTIFIC ATLANTA, TEXSCAN (T-SERIES/PATS)
GEN. INST./JEROLD, PHILIPS/MAGNAVOX

SEE OUR AD ON PAGE 127

TOP DOLLAR PAID FOR YOUR OBSOLETE INVENTORY!
WE MANUFACTURE REPLACEMENT PADS, EQUALIZERS
AND PLUG-INS

PH: 800.444.2288/310.715.6518

FAX: 888.4.MAINLINE/310.715.6695

EMAIL: MAINLINE@WORLDNET.ATT.NET

WEBSITE: WWW.MLE.COM

BUY • SELL • TRADE • REPAIR • UPGRADE • BUY • SELL

**MIDWEST
CABLE SERVICES**

800-852-6276

Midwest Cable Services has been
in the cable recovery business for
16 years. Our services include the
purchase and removal of wreck-
out and reel end cable (all types).
Dumpster and trailer spotting for

job convenience. End of job
cleanups. We also purchase new
and used or obsolete line gear. Get
the most for your scrap, call
800-852-6276 or 219-892-5537,
fax: 219-892-5624

16 YRS OF NATIONWIDE SERVICE

PO Box 96 Argos, IN 46501

**WE BUY
SCRAP CATU
CABLE**

**WE BUY & SELL
SURPLUS NEW & USED**

Connectors, Taps,
Headend, Line Gear, Misc.

TM BROKERS

33 Bar Ranch • 767 Hultman Road
Swan Valley, MT • 59826
Tel: (406) 754-2469 • Fax: (406) 754-2548

SEE INVENTORY ON HOME PAGE

EMAIL: tmbrokers@montana.com
HOME PAGE: www.tmbrokersmontana.com
We Accept M/C or Visa

LINEGEAR & ACCESSORIES
NEW OR REMANUFACTURED

D.A. TECHNOLOGIES

1859-E BEAVER RIDGE CIRCLE
NORCROSS, GA 30071
(800) 416-0346
fax (770) 416-0446

REPAIRS AND UPGRADES

EMAIL:
sales@datechnologies.com

Call us first.

We have 8 warehouses of excess new inventory, sealed in the original boxes. These are the same products you'd get from the manufacturer — except cheaper, in stock, and ready to ship.

SA Multimedia Taps

We stock a complete line of taps and passives from 600 MHz to 1 GHz.

**Gilbert & LRC
Connectors**

We have a large inventory of pin, splice and feed-thru connectors to fit any size cable.

**SA 750 MHz System
Amplifier II**

We stock NEW amplifiers from 450 to 860 MHz at pricing usually less than the manufacturer direct.

**Pads &
Equalizers**

We have an extensive inventory of all values of pads and equalizers from every manufacturer of distribution equipment.

The latest equipment.
The best prices. In stock.

 **DIGICOMM**
INTERNATIONAL, INC.

www.digicomintl.com
T: 303-799-3444 • F: 303-799-9366

©1999 Digicom International, Englewood, Colorado

THE
**BROADBAND
TESTING
PROFESSIONALS**

Call
1-888-78-SWEEP
(1-888-787-9377) spectrumtech@msn.com

Spectrum
Technical Services

**YOUR CUSTOMERS WANT THE BEST
SO SHOULD YOU**

Spectrum Technical Services is the leading authorized contractor in broadband testing.

At Spectrum, only specially trained technicians conduct the certification testing to ensure the sweep and balance of your system meet the quality standards you and your subscribers demand. With our own fleet, a full-time staff of dedicated technicians and years of sweep experience, Spectrum provides a specialized testing expertise for a full range of technical services.

- Forward & Reverse Sweep
- Node Certification
- Ingress Suppression

Spectrum
Technical Services

Call for excellent job opportunities nationwide.

**YOUR
REVERSE
SWEEP
SPECIALISTS**
with over
3000
miles of return
experience & counting

Communications Technology

WHERE IT'S AT!!

CALL 1-800-325-0156, extension 23
for your Classified Advertising

SUBCARRIERS

- AUDIO AND DATA TRANSMISSION •
- SUBCARRIER TRANSLATORS •
- AUTOMATIC VIDEO/AUDIO CONTROL •



TEL: 800-235-6960 • WWW.FMSYSTEMS-INC.COM



PREFERRED TECHNOLOGIES, INC.

We Buy & Sell New and Refurbished:
Test Gear, Electronics, Tools, Coax, Trucks,
Converters, Headend Gear, Dropwire, Hardware

Also Available: 7-Day Lasher Repair • Fittings Transmitters •
Receivers • Conduit and more!

We Trim Budgets In A Big Way And Offer Prompt Deliveries...Call Today!
800-641-6138 (541-548-7327) fax 541-923-2436 • www.preferredtechnologies.com

Cable Source International

A Bren-Car Communications Company

New Build > Re-Build > Upgrade

The Source for all of your CATV needs: NEW, USED, AND REFURBISHED
CONVERTERS - LINEGEAR - HEADEND - PASSIVES - MICROWAVE

5172 SINCLAIR ROAD • COLUMBUS, OHIO • 43299

PHONE: (614) 841-9700 • FAX: (614) 841-9779

BUYING AND SELLING SURPLUS CABLE TELEVISION, SATELLITE, AND MICROWAVE EQUIPMENT

Wanted!

Experienced long term help for
Southeast rebuilds/upgrades

- Aerial Crews
- Fiber Optic Crews
- Underground Crews
- Splicers
- Installers
- Field Engineers

CABLE MAN, INC.

Call (228) 374-5832
Fax: (228) 374-2198



CAD
DRAFTING
SERVICES, INC.

Charles Wright
(815) 698-2564
Rt. 116 & I-57, Central Plaza
Ashkum, IL 60911
cws@dlogue.net

- Base Mapping
- Strand Mapping
- Digitizing Services
- As-Built Mapping
- System Design
- System Walkout

Specializing in high volume precision drafting.

"Quality service for all your
cable drafting and design needs."
Call for literature.



Performance Built Our Company
Specializing In Rebuilds and
Fiber Optic Installation,
Splicing & Sweep

Cable Construction, Inc.

PERMANENT POSITIONS AVAILABLE!
NATIONWIDE

- Line Foremen
- Subcontractors
- Construction Supervisors

Harold Bigham
800-441-0780, Fax 850-932-1755

P.O. Box 903
Gulf Breeze, FL 32562

www.cabletoday.com



- ★ Your Industry-Specific Career Site!
- ★ Career Opportunities & Job Agent
- ★ BROADSEARCH™ Telecom Directory of 5000 Linked Companies!
- ★ The Largest Telecom Career Resource Anywhere!
- ★ BROADSEARCH™ Resume Database & Candidate Agent

www.BroadbandCareers.com

"Reach the Eyeballs That Count"

CABLE SEARCH ASSOCIATES

Professional Search & Placement

- Engineering
- Management
- Technicians
- Sales
- Marketing
- Construction

Call or Write:
Wick Kirby
P.O. Box 2347
Naperville, IL 60567
630-369-2620
630-369-0126 fax

FEES PAID

do work that matters

Advanced Technicians
Access Bandwidth Technicians

We are building the most ambitious high-tech network in the world, using broadband technology that changes the way information is shared. Imagine the limitless power of the telephone, television and the internet combined into one network — a network anyone can use.

Help us build it. Do work that matters.

AT&T Broadband
Attn: Kimberly Shaw
5240 Oakland Avenue
St. Louis, MO 63110
FAX: 314-655-5751

Email: shaw.kimberly.j@broadband.att.com



BROADBAND

877-801-JOBS (5627)

JOB.ATTBIS.COM

Drug test and background check required of all successful candidates.

AT&T Broadband is an Equal Opportunity Employer/AA

tesinc
Engineering and
Technical Services

2150 East Highland Avenue
Suite 212
Phoenix Arizona 85016
(602) 956-4401
FAX (602) 956-4664
resume@tesinc-inc.com

CATV IMMEDIATE OPENINGS

| | |
|---|--|
| RF ENG'S | INSPECTORS |
| LINK DATA, FIBRE MSL | SERIAL DS MSL |
| DRAFTERS | INSTALLERS |
| WIRELESS/MICROSTATION CATV & TELEPHONE | TRUCK & TOOLS |
| | TECHNICIANS |
| | HEAD END WIRELESS/DC PROOF SERVICE |

An Equal Opportunity Employer

Call Richard: 1-800-800-7886 or Fax: (602) 956-4664

TECHNICAL TRAINER

SCTE is looking for a Technical Trainer skilled in presenting, developing and training for the cable industry. Travel required. Position located in Exton, PA Bachelor's degree or equivalent work experience required. Experience in delivery of technical training programs within telecommunications industry helpful. Position closes Oct. 31, 2000. Please mail to:

HR, SCTE 140 Philips Rd.
Exton, PA 19341-1318

Fax: (610) 363-5898 (attn: HR)
e-mail: dmanoff@scte.org

SEE YOUR CAREER TAKE-OFF AT PHILLIPS!

If you're looking for:

- a leading multi-media B2B company
- quality products that include daily news broadcasts, newsletters, magazines, web-sites, and conferences
- challenging projects
- exciting markets: aviation/defense, telecommunications, cable television, media/pr, energy, satellite & banking
- team spirit and competitive employee benefits
- a suburban Washington, DC location

Then, consider Phillips Business Information ("PBI").

Founded in 1974, PBI's parent company (Phillips International) is a \$350 million company with over 1,000 employees and offices across the United States and worldwide. PBI specializes in offering full-service information and marketing solutions to our high-tech clients. Visit our web-site at <http://www.phillips.com/pbi> for more information!

We are currently accepting inquiries for opportunities in the following areas:

- Editorial • Sales & Marketing • Design & Production
- Information Technologies • Web Development

Forward your resume, cover letter (please reference code AOGR) and include salary history to:

Phillips Business Information, Inc.
Attn.: Human Resources
1201 Seven Locks Road, Suite 300
Potomac, MD 20854

Or, if you prefer, via email: pbijobs@phillips.com or fax: (301) 424-2231.



**Peter
Froehlich & Co.**
Executive search

SCTE Sustaining Member

P.O. Box 339 Weatherford, TX 76096
(800) 742-4947 FAX (817) 594-1337

email: pfsearch@flash.net
web: <http://home.flash.net/~pfsearch>

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



Are you looking for a growing company? Do you like the sound of twenty awesome benefits, including free cable?

Look to the Indianapolis Division of Time Warner Cable to fulfill your vision of your employment future. We are currently staffing positions in our Engineering Department.

HEADEND TECHNICIAN

Primary responsibilities include maintenance, repair and adjustments of all electronic equipment in headend operations. Also will support, install and maintain video fiber optic equipment. Minimum qualifications are as follows: high school diploma or equivalent; two (2) years of vocational training, advance electronics or cable television courses; 5 years experience trouble-shooting and repairing of electronic, plant and/or headend equipment; ability to lift 70-90; passing knowledge test of equipment, theory, and signal transport systems, basic skills in headend, video production and lighting; driver's license with good driving record; ability to read and understand manufacturers' manuals.

DESIGN COORDINATOR

Primary responsibilities include designing and maintaining data pertinent to the construction and activation on CATV plant in the division. Minimum qualifications are as follows: high school diploma or equivalent; three (3) years CATV or FOCUS experience as well as CATV design knowledge; ability to effectively present information and respond to questions from managers and division personnel; ability to sit at least eight hours; computer-aided design is very helpful.

CONSTRUCTION SUPERVISOR

Primary responsibilities include maintaining the physical and mechanical integrity of the cable system by protecting plant against damages and by ensuring that high quality standards are met when repairs become necessary. Minimum qualifications are as follows: high school diploma or equivalent, three to five (3-5) years of experience in CATV construction or equivalent experience in a related industry.; complete knowledge of TWC construction specifications; ability to perform all facets of construction work; fiber optic theory and applications training or experience; valid driver's license with good driving record, and good communications, organization, administrative and interpersonal skills. Previous supervisory and PC skills are highly desirable.

We are also staffing Construction Technician, Maintenance Technician and Installer positions.

APPLY TODAY: Submit resume and cover letter to Time Warner Cable, Human Resource Department, 3030 Roosevelt Avenue, Indianapolis, IN 46218. Fax: 317-632-5311. E-mail: damita.clayton@twcable.com. EOE

THE COMPASS GROUP
RECRUITING SERVICES

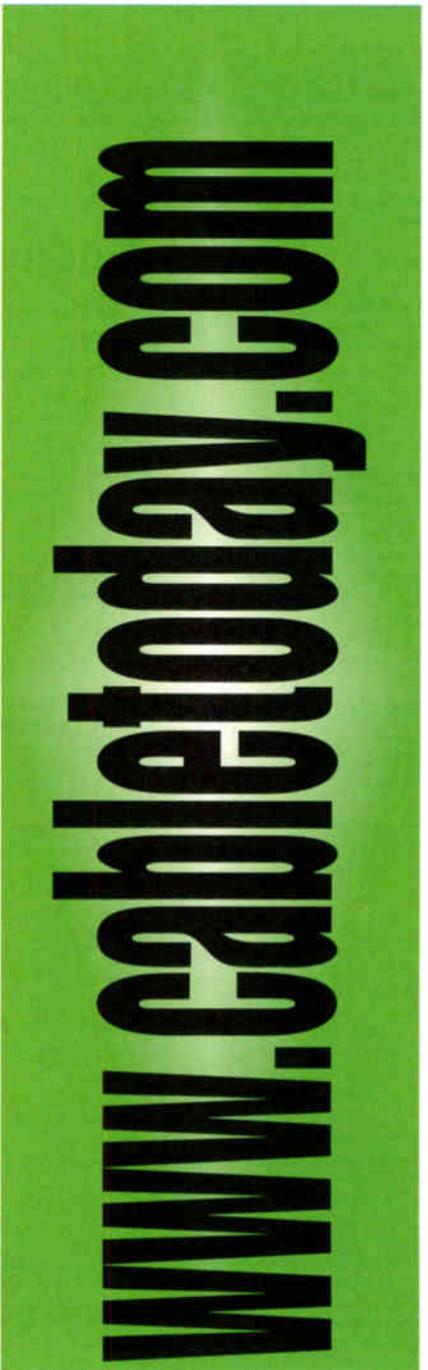


More Challenge? Increased Compensation?
Location Change? Promoted Responsibilities?

Opportunities for
Maintenance Techs
Technical Managers
Service Techs
Chief Techs

Contact: Kathy Daniel
www.thecompassgrp.com

3514 STAGCOACH TRAIL • WEATHERFORD, TX 76087
PHONE:(800)795-0299 • FAX:(817)594-5734
e-mail: recruit1@airmail.net



CAREER OPPORTUNITIES

Since 1975 Leader in the Placement of Cable TV Professionals

JOBS GALORE!!

Technical • Sales & Marketing • General Management



Holland Creek • 1424 Clear Lake Rd. • Weatherford, TX 76086
Call 817-599-7623 • FAX 817-599-4483 • E-Mail jyoung@staffing.net

CONTEC

CAREER OPPORTUNITIES

Contec is more than just the largest service provider to the broadband communications industry. We are also the only authorized Digital Receiver Warranty Service Center for Motorola, Philips, and Scientific Atlanta. Specializing in the manufacturing, service, remanufacture & reconfiguration of products for broadband communications applications, we are looking for great people to join our growing team of Engineering and Technical staff in our Schenectady, New York location.

Requirements for our Engineering Department are a working knowledge of computers, commercial test equipment, signal generation and signal transmission. Hands on knowledge of Unix, Windows 9x, Windows NT is preferred; knowledge of Visual Basic, C++, networking, IP, IP telephony and test equipment automation interfaces is a plus. These highly visible positions will require excellent written and verbal skills. Some travel will be required. BS/EE or equivalent experience is required with knowledge of current industry technologies and design architectures.

Engineer - Digital Video Services

Contec is seeking engineers with experience in digital video and cable modem services. Qualified candidates will be directly involved in the development, support and growth of our digital service offerings. A minimum of 2 years of progressive cable television engineering experience is preferred with familiarity of cable, satellite and MPEG transmissions and DOCSIS requirements. BS/EE or equivalent experience is required (MS preferred) with knowledge in communications technology and/or digital signal processing. The successful candidate will develop and support service operations including testing, automation activities and expanding our service offerings. Design and development for product upgrades and enhancements will also be an integral role for this position.

Associate Engineer - Remote Control Units (RCU's)

The successful candidate will be directly involved in the research, development, design, evaluation, testing, support and growth of our highly successful line of Remote Control Units (RCU's). Responsibilities include the direction and coordination of all activities concerned with the design, development, procurement, manufacturing and testing of RCU's. The ability to effectively communicate, prioritize tasks and serve as a liaison between Engineering, Marketing, Materials and vendors is essential for success in this position.

Contec offers a competitive compensation & benefit package featuring health, dental, 401K w/match, life insurance, and tuition reimbursement. If you are qualified for the above positions please mail, email, fax (no phone calls please) your resume to:

CONTEC

Attention: Director, Human Resources
1023 State Street
Schenectady, New York 12307-1511
Fax: 518-372-5051

e-mail: www.jobs@gocontec.com

Contec is an Equal Opportunity Employer

For other career opportunities, visit our website at www.gocontec.com

Product Line Manager

Responsible for expanding the wound ferrite core business. Engineering degree & a min. of 5 yrs. experience designing & building of RF components for the CATV industry. Travel required. Forward resume & salary to:

MMG NA, 126 Pennsylvania Avenue,
Paterson, NJ 07503. Fax: 973-279-6611.
www.mmгна.com

CATV Design Engineer

Global CATV Electronic Company seeking individual with a minimum of 5 years experience in circuit design and video processing communication system hardware design. Excellent benefit package

Email resume with salary requirements to:
hrs@viewsonics.com or
fax to: 954-972-4945 EOE

Viewsonics inc.
Share the Vision



Position: Applications Engineer

Job Description: Based in our Indianapolis, IN facility, you will be responsible for providing technical and applications support to Trilithic customers in the activation, maintenance and monitoring of advanced broadband communications networks. Domestic and International travel is required. A generous compensation package commensurate with experience will be provided. The ideal candidate will have a solid CATV background with technical training experience. A BSEE/BSEET or equivalent in work experience is preferred. Interested candidates should send their resume to:

Trilithic, Inc., Human Resources Dept.,
9202 East 33rd St. Indianapolis, IN 46235

Strategic Accounts Manager

Manage all aspects of business with designated strategic customers including engineering assistance, new product development, overseeing order production, customer visits & presentations. BSEE & a min. of 5 yrs. experience. 25% travel. Forward resume & salary to:

MMG NA, 126 Pennsylvania Avenue,
Paterson, NJ 07503. Fax: 973-279-6611.
www.mmгна.com



CATV ENGINEER

Rutgers University seeks a CATV Engineer to resolve high-level technical problems related to the configuration, installation, support, and repair of the Rutgers University Cable Television Distribution System. Will troubleshoot problems associated with a 750 MHz HFC plant; includes OSP and ISP service/repairs. Performs tests on plant using signal level meter, OTDR, TDR, spectrum analyzer and other test equipment to comply with system design and FCC specifications.

Please send your resume and salary requirements to: Rutgers University, Attn: Mr. Odell, Computing Services, 96 Davidson Rd., Piscataway, NJ 08854-8062 E-mail: sodell@rci.rutgers.edu Fax: 732-445-5539

Account Manager Rocky Mountain Region

MHz is currently accepting resumes from qualified individuals interested in a career opportunity in sales!

Cable Television technical background required.

Salary+Commission+401K+Dental

Send. Fax or e-mail Resumes to:

Mega Hertz

Attn: Human Resources
6940 S. Holly Cr., Suite 200
Englewood, CO 80112
Fax: 303-779-1749
Email: adm@megahz.com



Find your next
Engineer in
Communications
Technology Magazine.

Contact Kelly Aarons at

**303.839.1565 x23 or
kaarons@phillips.com**

Break the Bank

[Not your Budget]

Want to generate solid sales leads while staying within your budget?

Phillips mailing lists are the affordable solution!

With over 30 different high-tech lists from which to choose, Phillips will maximize your profits while minimizing your costs!

Access the industry's most influential decision-makers...

Call Susan Incamato today at (301)340-7788, ext. 2026 or fax (301)738-7581 to find out why Phillips is your affordable mailing list solution!

Phillips Business List Sales
Your Direct Response Solution!

CALENDAR

October

3: Cascade Range Chapter BCT/E Testing Session. Contact Ned A Fenimore, (503) 631-2098.

3-4: Northwest Tech Days & Vendor Show, Portland, OR. Contact Kendell Robinson, (503) 245-2964.

4: Ark-La-Tex Chapter Technical Seminar, Shreveport, LA. Contact, Russell Gaston, (318) 377-9755.

7: Llano Estacado Chapter Cable-Tec & Vendor Show, Lubbock, TX. Contact Bob Baker, (505) 763-4411.

9-10: Virginia Cable Telecommunications Association Convention, Reston, VA. Contact, Kathryn Falk, (804) 780-1776.

12: SCTE Seminar, Atlanta. Contact, Jessica Dattis, (610) 363-6888.

14: Hill Country Chapter Technical Seminar, San Antonio, TX. Contact, Sherry Hefner, (210) 352-4211.

18-19: Southern California Vendor Show, Norwalk, CA. Contact Chuck Harper, (310) 647-6645.

19: Central Florida Tech Session and Vendor Show, Tampa, FL. Contact Joice Ventry, (850) 926-2508.

18: Badger State Chapter Technical Seminar, Fond du Lac, WI. Contact Randy Bunnell, (920) 339-8056.

19: Wheat State Chapter Technical Seminar, Wichita, KS. Contact Joe Cvetnich, (316) 262-4270 ext. 139.

21: Cactus Chapter Technical Seminar, Tucson. Contact Brenda Hunt, (602) 332-2003.

25: Michiana Chapter Meeting, Contact Russ Stickney, (219) 259-2112.

26: Central California Chapter Technical Seminar and Testing Session, Fresno, CA. Contact Roger Paul, (559) 253-4685.

PLANNING AHEAD

- > **Nov. 8-9: OSP Expo 2000**
Nashville, Tenn. Contact OSP at (847) 639-2200.
- > **Nov. 20-Dec. 1: Western Show**
Los Angeles. Contact California Cable TV Assoc.(510) 428-2225.
- > **Jan. 8-10 Emerging Technologies Conference**
New Orleans. Contact SCTE, (800) 542-5040
- > **Feb. 28-Mar. 1: Texas Show**
San Antonio. Contact SCTE, (610) 363-6888.

See your career take-off at Phillips!



If you're looking for:

- a leading multi-media B2B company
- quality products that include daily news broadcasts, newsletters, magazines, web-sites, and conferences
- challenging projects
- exciting markets: aviation/defense, telecommunications, cable television, media/pr, energy, satellite & banking
- team spirit and competitive employee benefits
- a suburban Washington, DC location

Then, consider Phillips Business Information ("PBI").

Founded in 1974, PBI's parent company (Phillips International) is a \$350 million company with over 1,000 employees and offices across the United States and worldwide. PBI specializes in offering full-service information and marketing solutions to our high-tech clients. Visit our web-site at <http://www.phillips.com/pbi> for more information!

We are currently accepting inquiries for opportunities in the following areas:

- Editorial
- Information Technologies
- Sales & Marketing
- Web Development
- Design & Production

Forward your resume, cover letter (please reference code AOCR) and include salary history to:

Phillips Business Information, Inc.
Attn.: Human Resources
1201 Seven Locks Road, Suite 300
Potomac, MD 20854

Or, if you prefer, via email: pbijobs@phillips.com or fax: (301) 424-2231.

A vertical chain of overlapping circles, each containing a word. The circles are arranged in a column, overlapping slightly. The words are: news, analysis, technology, people, and the inside scoop. The circles are light gray and the text is black.

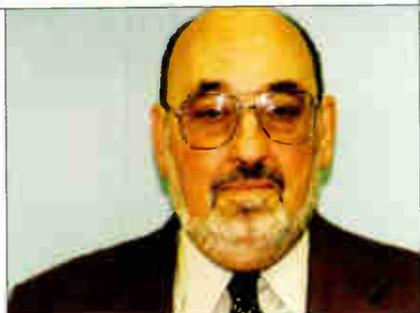
news

analysis

technology

people

the inside scoop



Becoming a Broadband Service Technician

Not long ago, customer service was a subject that did not hold as much significance as it does today. Competition has changed our outlook and made us take a closer look at where we are, and where we need to be headed.

I refer to customer service pertaining to the cable TV business as something we always should have taken very seriously. The **Society of Cable Telecommunications Engineers** (SCTE) recognized this need and made it an integral part of the new Broadband Service Technician (BST) program. In fact, one of the three exams focused on just that subject,

with an emphasis placed on creating and demonstrating our need to establish a good image for ourselves and the companies we represent.

As important as customer relations is, it represents only a third of the entire BST program. The other two categories—technical foundations and troubleshooting—focus on the technical aspects of cable service work. A service technician's work begins at the customer's terminal and ends at the distribution or feeder amplifier, basically running throughout the neighborhood or distribution plant. Following is a discussion of the technical knowledge

expected to become a certified BST.

First, we review the technical foundation exam and the knowledge expected to pass a 50-question exam. The candidate must have a working knowledge of the installation itself—wiring from tap to terminal—including routing, clearances, safety, picture quality and a good working knowledge of all components and customer equipment used in the installation. Secondly, each candidate needs a working knowledge of outside plant conditions and equipment used to deliver signals to the house. Another important part of the service techni-

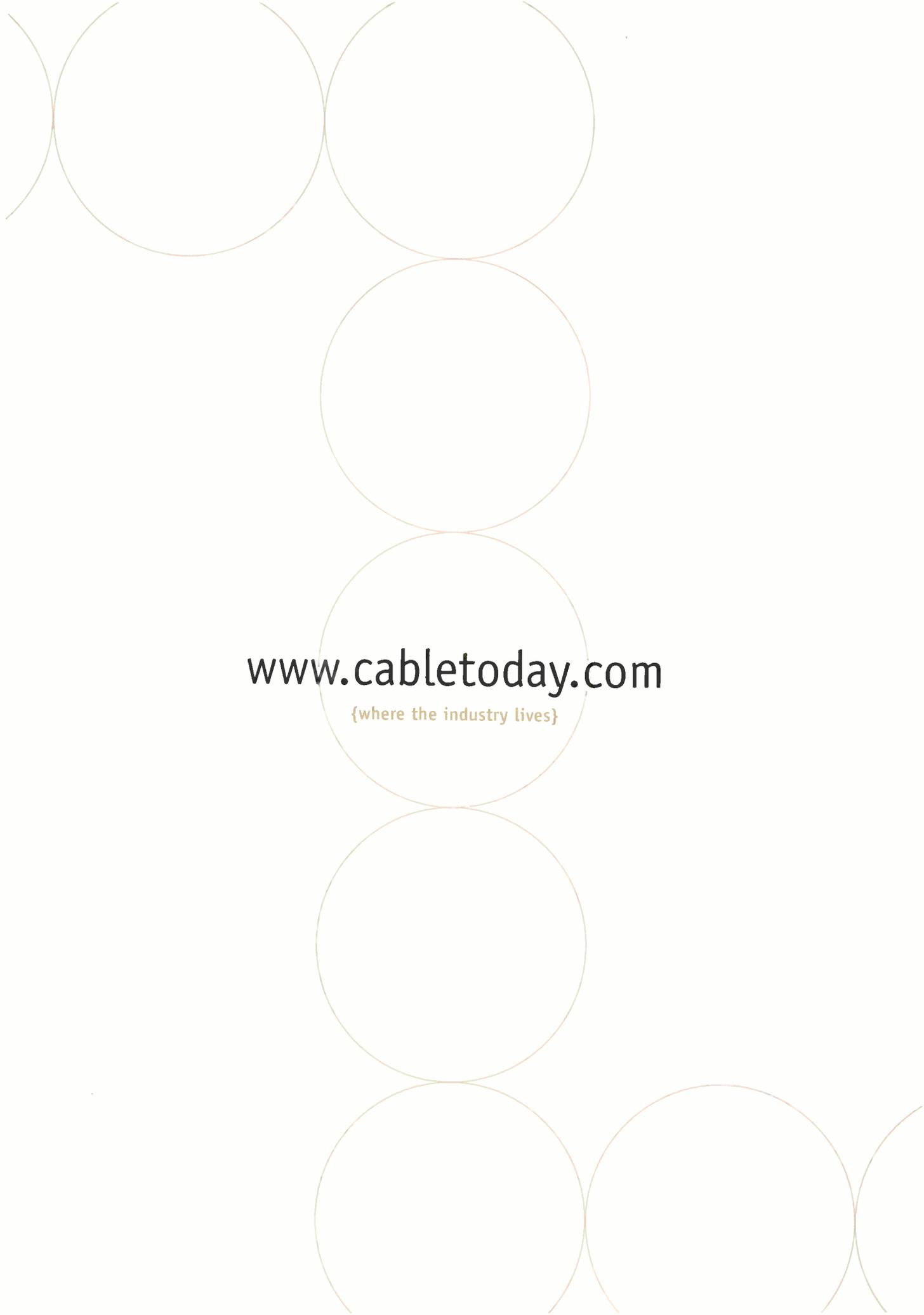
> Broadband Service Technician Outlines

Technical Foundations

- I. CATV overview
 - a. Distribution Model
 - b. NTSC Signals
- II. Drop Equipment
 - a. Drop Cable
 - b. Passives
 - c. Actives
 - d. Security devices
 - e. Network Interface Devices (NIDs)
- III. Distribution Equipment
 - a. Distribution cable
 - b. Actives
 - c. Passives
 - d. Powering
- IV. Terminal Equipment
 - a. Set-top boxes
 - b. Digital systems
 - c. TV's
 - d. VCRs
 - e. Stereo receivers
 - f. Other customer premises equipment
- V. Maintenance & Safety
 - a. Test equipment

- b. Tools
- c. Climbing
- d. OSHA
- e. FCC Rules
- f. NEC/NESC codes
- VI. Installation Practices
 - a. Aerial
 - b. Underground
 - c. Interior Wiring
- VII. System Problems
 - a. Outages
 - b. Impairments
- Customer Service Outline
 - I. Professionalism
 - a. In person
 - b. Non-customers
 - c. Vehicle appearance
 - d. Personal appearance
 - e. Doing the job right the first time
 - II. Customer Relations
 - a. NCTA Standards including the "On-Time Guarantee"
 - b. Retaining customers
 - c. Internal vs. external customers
 - d. Listening

- c. Probing
- f. Telephone etiquette
- g. Conflict resolution
- h. After-hours calls
- III. Product Knowledge
 - a. Basic
 - b. Tiers
 - c. Pay
 - d. PPV
 - e. Data
 - f. Telephony
 - g. Digital Video
 - h. Data Services
 - i. Digital Music Services
 - j. Pricing structures
 - k. Community programming
 - l. Local Advertising
 - m. Know and recognize competitors
- IV. Sales and Marketing
 - a. Selling yourself
 - b. Upgrading services
 - c. Looking for sales opportunities
 - d. Identifying objections
 - e. Overcoming objections
 - f. Closing the sale



www.cabletoday.com

{where the industry lives}



Break the Bank

[Not your Budget]

- Want to generate solid sales leads while staying within your budget?

Phillips mailing lists are the affordable solution!

With over 30 different high-tech lists from which to choose, Phillips will **maximize** your profits while **minimizing** your costs!

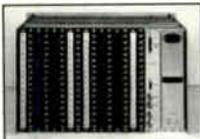
Access the industry's most influential decision-makers...

Call Susan Incarnato today at (301)340-7788, ext. 2026 or fax (301)738-7581 to find out why Phillips is your affordable mailing list solution!

 **Phillips Business List Sales**
Your Direct Response Solution!

"PathMaker"

Analog/Digital/QAM Matrix Routing System



- 16x16 to 128x128

- 100+ MHz/CH.

- True Cross-Point Switching

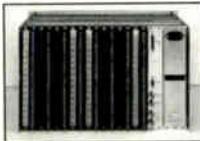
- 5 Year Warranty

- Hot Swappable Modules

- Windows Control & Scheduling Software

- Remote Controllable

- Redundant Power Supply



"PathMaker" has the highest technical specifications in the industry!

800-922-9200

www.megahz.com • engineering@megahz.com

MHz
MEGA HERTZ

Established 1975

Introduces

SIGMA
ELECTRONICS INC.

"Unique" Products For the 21st Century!

Oregon, Arizona, Colorado, Texas, Missouri, Ohio, Pennsylvania, Georgia, Florida, New Hampshire

cian's work is the ability to diagnose and repair picture impairments brought about by carrier-to-noise problems, intermodulation and anything else causing picture or audio problems. Technicians need to know what these problems look like, and how to find and fix them.

Next comes the final portion of the exam, in which a candidate demonstrates the ability to actually troubleshoot problems. This is a computer-based test where points are gained or lost based on the troubleshooting tests and checks you decide to do. Importance is placed on the steps taken to solve a problem. SCTE offers student-training manuals to support these examinations and help you gain the knowledge, not only to pass the exams and become certified but to further your own interests and make you a better service technician.

If this sounds like a sales pitch, you bet it is. More importantly, it is a desire to have more qualified people work on the problems affecting a good portion of our plant. Any manager or supervisor responsible for maintaining picture and audio quality should endorse this program. It will pay big dividends in the quality of service work being performed. SCTE has developed a series of student workbooks to help in the preparation for this certification. A book and videotapes on math are available, as well as a technical foundations manual and a manual with a practice CD on troubleshooting. Also available is the customer-service training manual. Look up the bookstore at SCTE's Web site (www.scte.org) or in the latest issue of *Inside Resources*.

Don't wait, participate now! □ T

Gary Selwitz is director of certification, SCTE. He can be reached at gselwitz@scte.org.

Did this article help you? Let us know your thoughts. Send an e-mail to snayalkar@phillips.com.



{where it's moving}



Explore the Possibilities at Emerging Technologies 2001

Sixty years ago, the idea of delivering television programs over cable lines was a pipedream. By December 1999, nearly seven of every 10 U.S. television households subscribed to cable television, according to Paul Kagan Associates. Ten years ago, no one had heard of the Internet. Now consumers are crying out for faster online communications made possible through fiber-optic cable. Then there was the advent of telephony over cable. Who would have thought any of this would be possible?

“The ET conference affords a look five years into the future of broadband.”

Well, there is a lot of truth to management thinker Peter Drucker's famous saying, “If you fail to plan, you plan to fail.” With the rate of change in our industry and the global marketplace, taking time to look ahead is essential to continued success.

With this focus in mind, the Society of Cable Telecommunications Engineers created the Conference on Emerging Technologies (ET). Every January for the last six years, broadband leaders from around the globe have gathered at this event to explore the possibilities that the future holds.

The conference affords a look five years into the future of broadband as presented by industry leaders who are

forging the way to tomorrow. Speakers and topics are selected by a distinguished committee of industry professionals, led by the renowned Walt Ciciora, Ph.D., co-author of *Modern Cable Television Technology*. Topics under consideration include:

- Digital voice, video and data systems
- Networking monitoring and operation
- Network architectures
- Service transport
- Integration

The 2001 conference will be held Jan. 8-10 in New Orleans. Thanks to the fine sponsorship of **Vi-source Communications**, ET will feature special

keynote speaker Daniel Burrus, a leading technology forecaster and futurist. Burrus is founder and CEO of **Burrus Research Associates**, a research and consulting firm that specializes in global innovations in science and technology, their creative application and future impact.

Over the past two decades, Burrus has established an exceptional record of accurately predicting the future of technological change. He has helped hundreds of clients develop successful competitive strategies based on the creative application of leading-edge technologies. *The New York Times* describes him as “one of America's top

three business ‘gurus’ in the highest demand as a speaker.” His Web site is www.burrus.com.

Through the conference's technical sessions, luncheons, evening receptions and breaks, attendees will enjoy the opportunity to network, discuss hot topics, problem-solve and share experiences.

The conference provides the perfect setting to recognize the recipients of the Emerging Technologies Awards and to celebrate their contributions to the industry. The technology awards include the Polaris Award, the Innovation in Deployment of Emerging Applications (IDEA) Award and the Star of Integrity Award. The Corning-sponsored Polaris Award, in particular, is presented to a member of SCTE who is an engineering manager who displays exceptional achievement in and commitment to the development and/or use of optical fiber.

Our industry has flourished under the leadership of visionaries who have taken the unthinkable and made it into reality. Why not plan to join them this January in New Orleans? For more information, visit www.scte.org or contact SCTE at (610) 363-6888.

John Clark is president and CEO of the Society of Cable Telecommunications Engineers. You can reach him at jclark@scte.org.

Did this article help you? Let us know your thoughts. Send an e-mail to snay-alkar@phillips.com.



ELECTROLINE

The Original Addressable System

CONTACT MONEY TALKS :

TOLL FREE • NORTH AMERICA (800) 461-3344
GENERAL INQUIRIES info@electrolinequip.com

ELECTROLINE EQUIPMENT INC.
8265 St-Michel Blvd.
Montréal, Québec Canada H1Z 3E4

ELECTROLINE

www.electrolinequip.com

Money Talks!

Electroline's Addressable Tap System means **MONEY IN THE BANK!**

- Money from dramatic reductions in truck rolls, overdue accounts, non-pay disconnects and cable piracy
- Money from increased market penetration and customer satisfaction

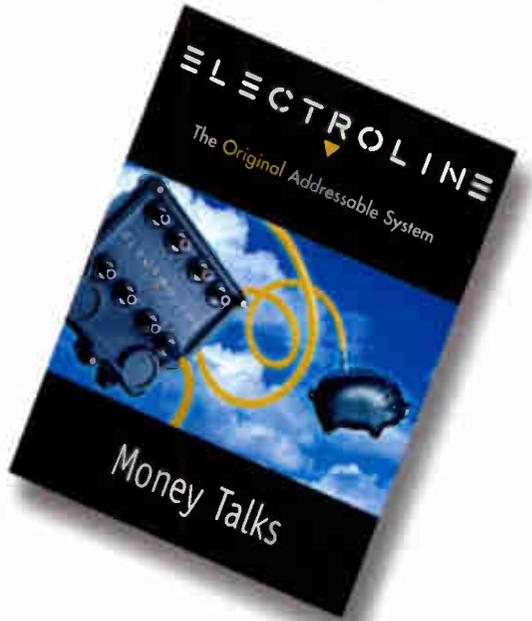
THE PROOF

Over four million ports shipped worldwide and thousands of satisfied customers since 1983

- By far, the only field-proven and most widely used addressable tap on earth

Make the Electroline Addressable Tap System

work for you.



Request a free trial today,
in your toughest outage
location

Webster Had It Right



re•li•a•ble *adj.* that which can be relied on, such as Multipower,
as in the "Multipower broadband UPS power supply"
re•li•a•bil•i•ty *n.* re•li•a•bly *adv.*

The Definition of Reliability is:

MULTIPOWER

Please e-mail us about Soft Start:
steve_kaplan@multilinkinc.com



© Multipower, Inc. 2002. All Rights Reserved.

MULTIPOWER INC.

Phone: (440) 366-6643 Fax: (440) 366-1036

www.multipowerups.com

Contact your
nearest Multipower rep.

A Company of

multilink
Broadband