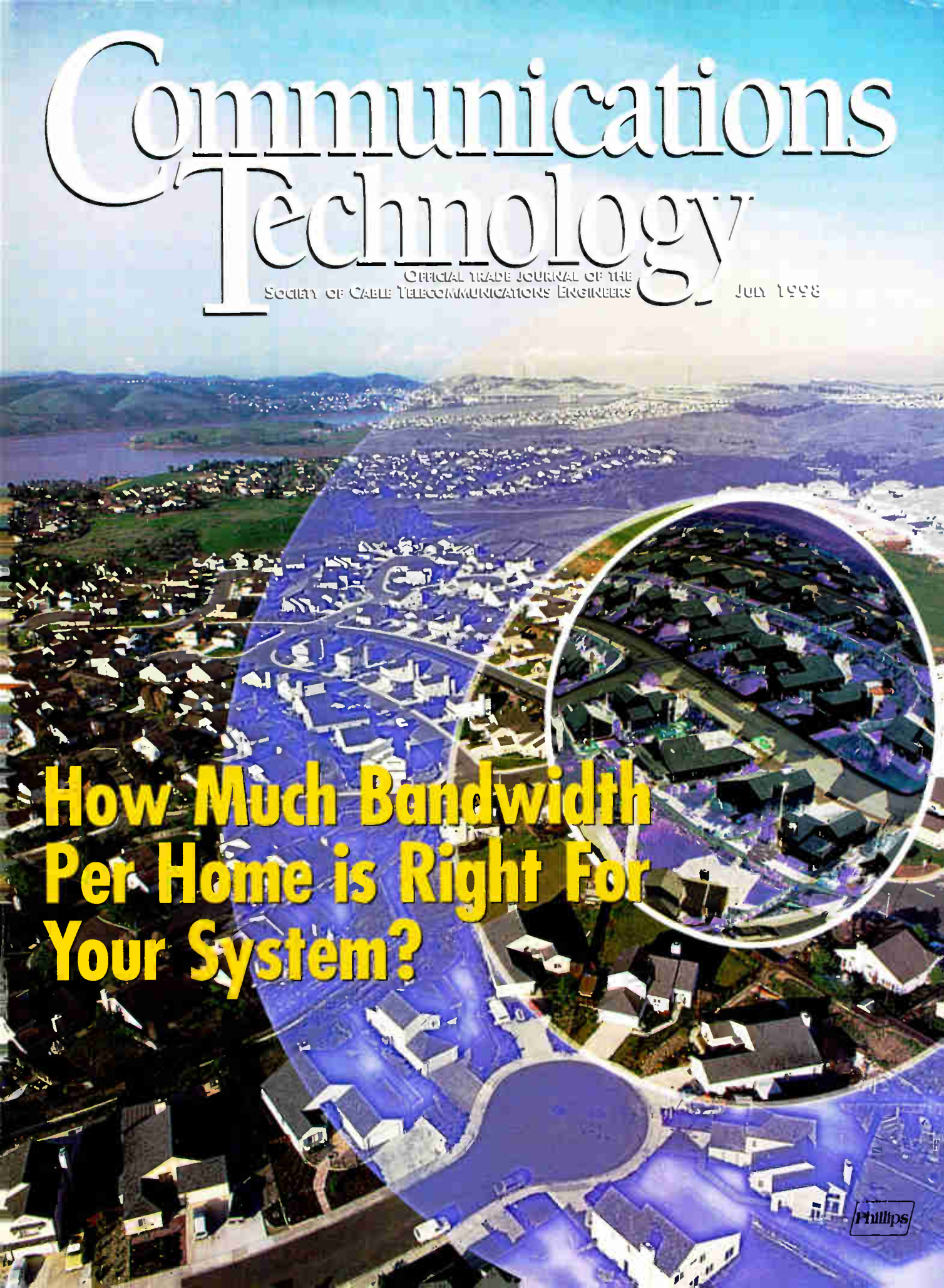
Communications Technology

Official Trade Journal of the Society of Cable Telecommunications Engineers

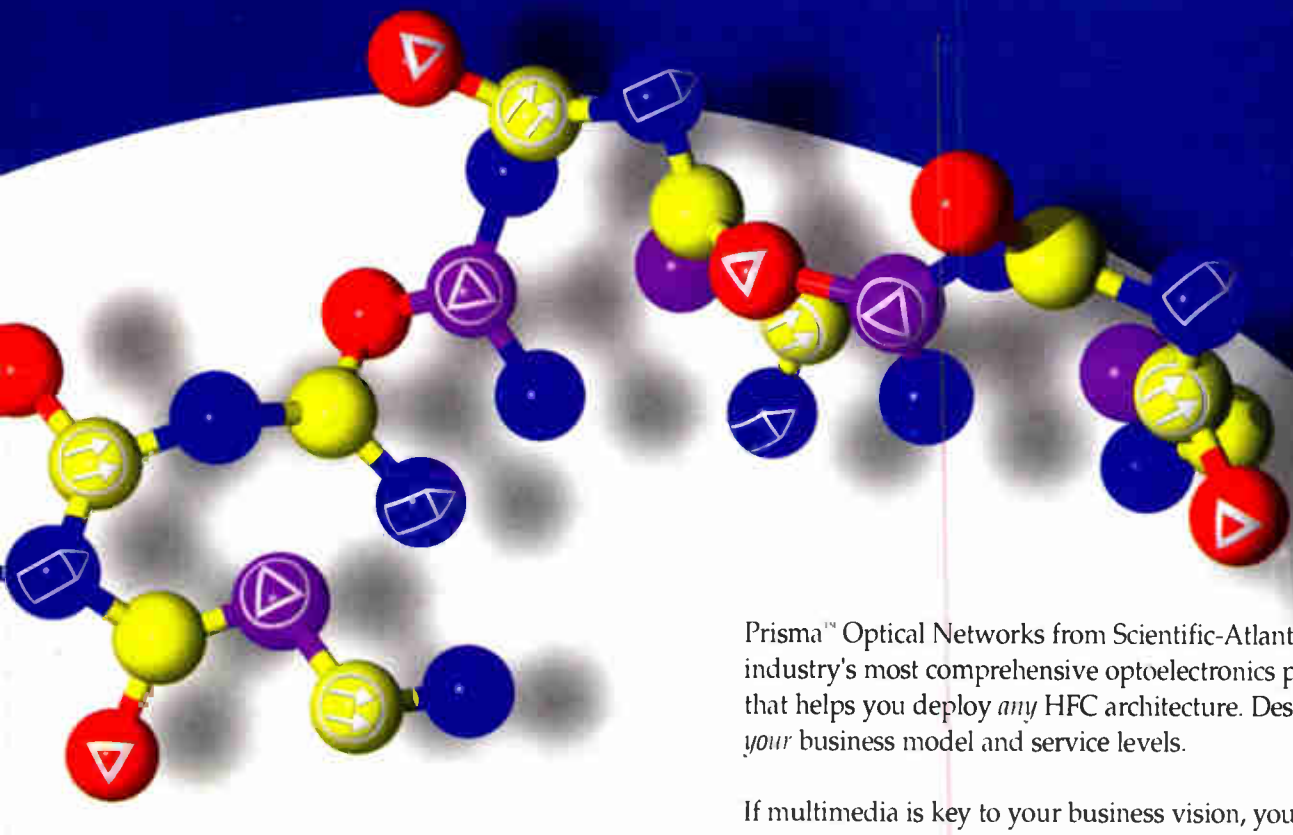
July 1998



How Much Bandwidth Per Home is Right For Your System?

HFC Building Blocks For Infinite Architectural Possibilities

Scientific Atlanta



Prisma™ Optical Networks from Scientific-Atlanta. The industry's most comprehensive optoelectronics platform that helps you deploy *any* HFC architecture. Designed for *your* business model and service levels.

If multimedia is key to your business vision, you need the most flexible and cost-effective optoelectronics options. And as fiber goes ever deeper, your choices become more critical. Looking to offer high-speed Internet access, digital video, or full-duplex voice and data? Then launch our SDH/SONET compliant Prisma Digital Transport and Dense Wave Division Multiplexing solutions. Or, deploy our 1550 nm-to-node and 1310 nm WDM overlay technologies for broadcast and targeted services, and our fiber optic nodes for serving area distribution.

To discuss your architectural needs, call us at 800-433-6222. We'll show you how Prisma Optical Networks makes your architecture possible.

www.sciatl.com

Reader Service Number 1

Not All QAM Signals Are Measured The Same

Sencore's New QAM Analysis Meters Provide:

- Full Frequency/Channel Tuning
- Digital Power/Level Measurements
- Exclusive Estimated BER Testing
- Digital Equalization Measurement
- Quick Good/Bad Visual Test For Acceptable Levels
- All Weather Proof Design

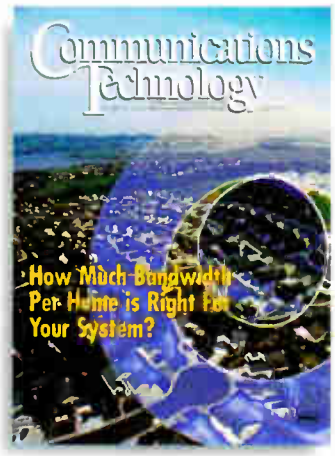
Includes Sencore's Exclusive 3-Year Warranty.

Sencore offers a QAM Analysis meter designed specifically for your system and its unique testing requirements. To find out how we can solve your digital testing needs, simply call us at 1-800-SENCORE.

SENCORE

contents

FEATURES



On the Cover:
Get your network ready for the future with node-design tips starting on pages 46 and 50.

Added EAS Value • 70

 Communications Technology™ (ISSN 0884-2272) is published monthly, except twice in May, by Phillips Business Information Inc., 1201 Seven Locks Road, Suite 300, Rockville, MD 20854, USA. Editorial and sales offices located at 1900 Grant St., Suite 720, Denver, CO 80203 USA, (303) 839-1565. July 1998, Volume 15, Number 8. Periodicals postage paid at Rockville, MD, and additional mailing offices. POSTMASTER: Send address changes to *Communications Technology*, P.O. Box 3230, Northbrook, IL 60065-9647.

Dual Isolated Outputs.

Industry's first 90V/20A Power Supply.

Proven CableUPS® uninterruptible power.

100% front panel access, test points and connections.

LCD Smart Display for real-time operation information.

Programmable, 3 stage temp-compensated battery charger.

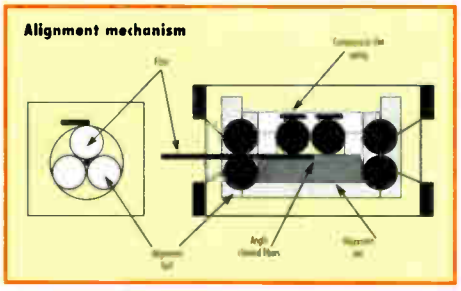
The [Power] of Choice.

Alpha's new XM Series 2 offers the industry's first 90 volt, 20 amp power supply—ideal for the simple upgrading of applications requiring additional power. Enhanced product design allows 100 percent front panel connections and test points for easier and more efficient maintenance. Dual isolated outputs provide improved protection and enhanced system reliability. Alpha offers a full line of power solutions as well as complete field maintenance and installation services for all communication powering applications. All this from a name trusted by operators around the world. **Investigate the [Power] of Alpha @ 800-421-8089.**

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

Reader Service Number 3

contents



Simple Fiber Splices • 72

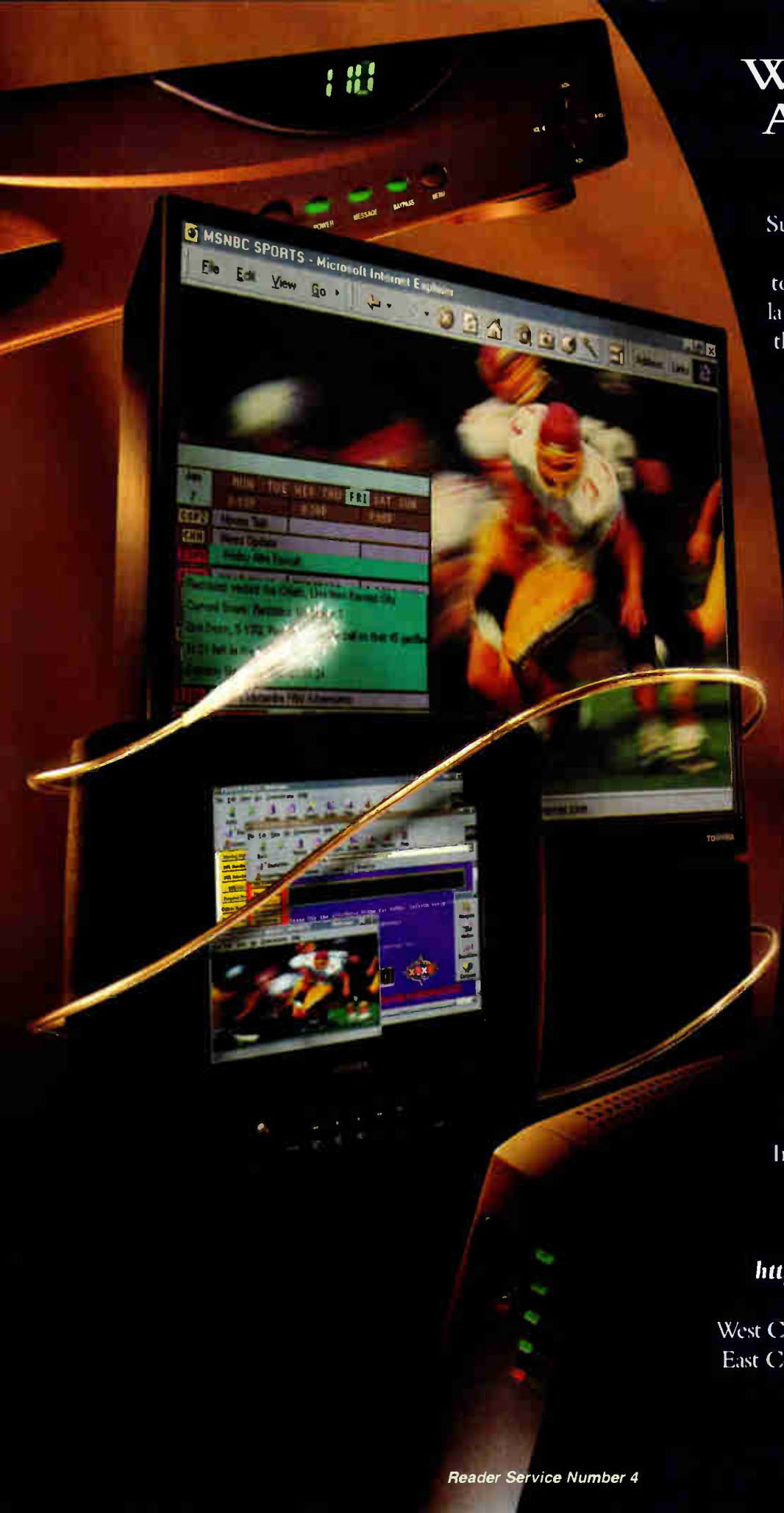
Steve Johnson • 102

DEPARTMENTS

NEWS & OPINION

REFERENCE

COLUMNS



We've Tied It All Together.

Experience, Technology, Support and Commitment. Toshiba has brought it all together. And as one of the largest system integrators in the cable industry, we offer a complete high-speed, turn-key system for data transfer over conventional cable networks.

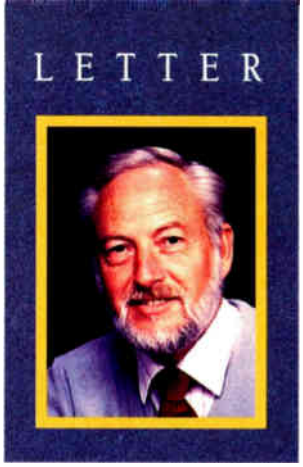
Our head-end configuration and modems are capable of supporting systems with greater than a million cable subscribers and are already up and running in six major cities nationwide for Time-Warner.

Installation, integration and system maintenance makes Toshiba the top choice for you and your customers. We can provide all hardware and software required to initiate and maintain your network.

So if you don't want any loose ends with your Internet system, let Toshiba tie it all together. For more information, visit our website:
http://Internet.Toshiba.com
or call us at:
West Coast Office: **925.820.7815**
East Coast Office: **973.316.2728**

In Touch with Tomorrow
TOSHIBA

Reader Service Number 4



By Rex Porter

Have Our Courts Gone Mad?

According to a recent press release, a federal judge ruled in a patent infringement lawsuit that a U.S. patent held by Intellectual Property Development Inc. covered hybrid fiber/coax (HFC) cable networks of the type employed throughout the cable industry.

The release says HFC was invented by Rediffusion Inc., the largest British cable company, later part of Maxwell Communications.

The release identifies the patent number but not its date. The original definition of HFC networks was simply, "The use of optical fibers and cable within the same network—usually refers to a communications network." There was no particular architectural design—no design of nodes or other things common to HFC networks.

I know U.S. cable engineers have been designing cable systems with fiber and cable since 1976 because I helped with these designs. I was not aware of any HFC networks' being designed or tested in Britain then. No information came from Rediffusion concerning their having a patent for HFC networks, and I only remember them transporting cable signals by an unusual coaxial method.

For those who don't know, the Rediffusion method was one in which single channels were transmitted to the home via individual drop cables. In the '70s, I was involved in the marketing and sale of cable from a major plant in Connecticut. We had an order to bundle cables for two systems in California so they could test Rediffusion.

Both trials were such failures that industry technicians and engineers commonly referred to the method as "Reconfusion." But where were these people when we field tested their methods back then? Did they know the trials would fail and decide not to be ridiculed when asking for patent money?

Are the courts saying a fully coaxial cable system does not infringe but that adding a fiber to the line does? Let's see if I get this right—if you string coaxial cables, that's OK. If you run fiber only, that's OK. But if you mix coax with fiber, you're in trouble. How could anyone get a patent on this?

IPD has magnanimously offered to license the HFC patent to the respondent in the case. I'll just bet they have.

And, "We have notified all major U.S. and Canadian cable operators of the patent and are willing to similarly offer reasonable licenses to any cable operator." Imagine that.

Have you also notified all local area network (LAN) and wide area network (WAN) users around the world? They use both coax and fiber in their systems. And how about the telephone companies? They use copper wire, coax and fiber in their architectures. And there are some really big electric utilities using fiber along with their power lines.

There probably isn't a modern communications system anywhere that doesn't use coax and fiber together. So, sue the world. CT

Rex Porter
Editor

FIT FOR A KING

PROUDLY SERVING THE CABLE INDUSTRY
50 YEARS
SINCE 1948

But without the royal price tag.

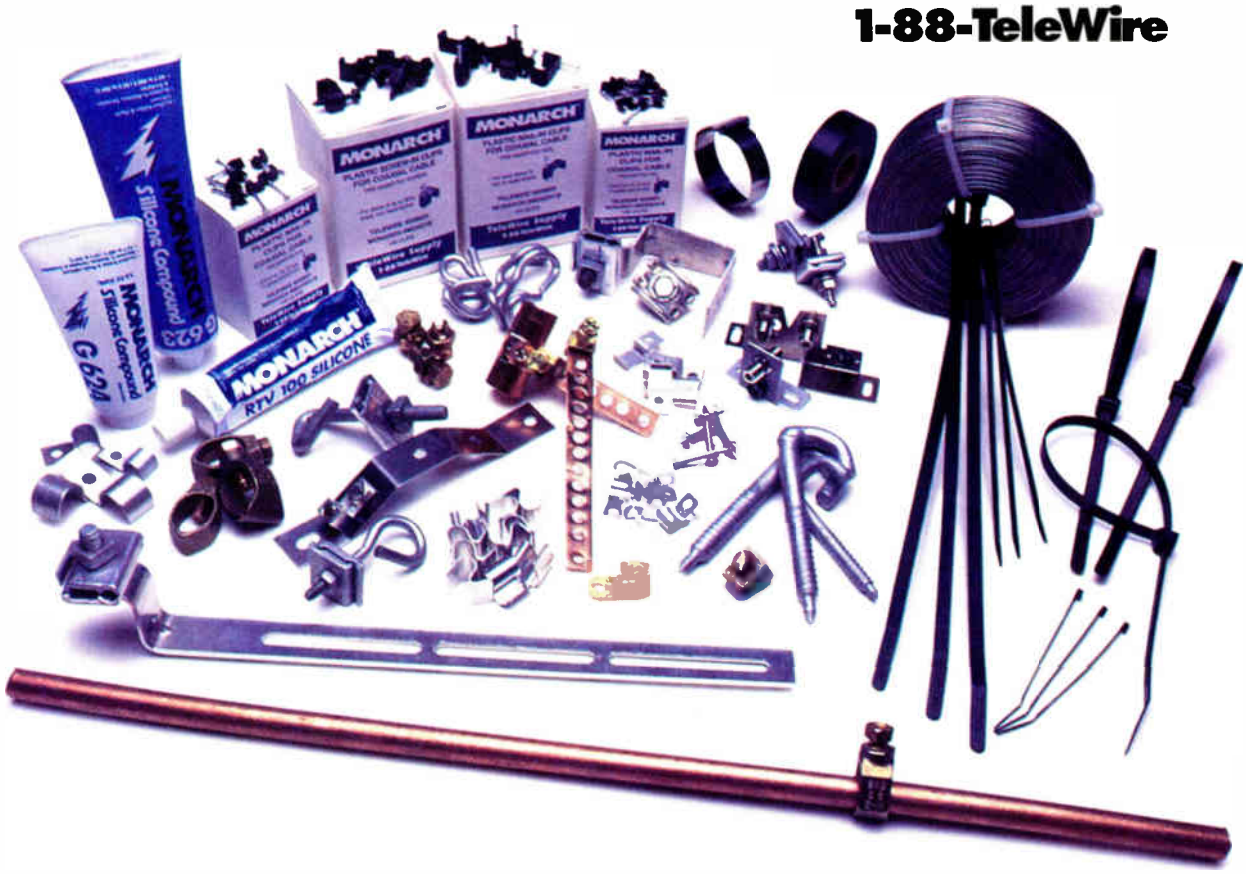
Who says quality has to cost more? Ask for Monarch products and accessories from TeleWire Supply. They're guaranteed to give your cable system the royal treatment.

Ask for it

MONARCH™

TeleWire SUPPLY
AN ANTEC COMPANY

1-88-TeleWire



SCTE BOARD OF DIRECTORS

Communications Technology

A CT Publications Product

EDITORIAL
EDITOR Rex Porter
EXECUTIVE EDITOR Alex Zavistavich
SENIOR EDITOR Laura K. Hamilton
ASSISTANT MANAGING EDITOR Ron Hendrickson
ASSISTANT FEATURES EDITOR Greta Durr
SENIOR TECHNICAL EDITOR Ronald J. Hranac
TECHNICAL CONSULTANT Michael Smith
INTERNATIONAL EDITOR Alex Swan

ADVERTISING/BUSINESS
PUBLISHER Nancy Maynard
SENIOR PUBLISHER Paul R. Levine: (303) 839-1565
ASSOCIATE PUBLISHER Tim Hermes: (301) 340-7788 ext. 2004
CENTRAL U.S. & CANADA Mike Elmer: (800) 325-0156, ext. 34
WEST David Gillespie: (303) 839-1565, ext. 35
EAST James Bahl (301) 340-7788, ext. 2060
CLASSIFIEDS Nicole Bovre: (303) 839-1565, ext. 33
CARD DECK Laralee Provenzano: (813) 797-2827
ADVERTISING ASSISTANT Susan Carp
ADVERTISING PRODUCTION COORDINATOR Joann M. Fato
ADMINISTRATIVE ASSISTANT Cathy Walker

DESIGN/PRODUCTION
ART DIRECTOR Maureen Gately
CREATIVE DIRECTOR Rob Hudgins
JUNIOR GRAPHIC DESIGNER Stephen Deutsch
PRODUCTION DIRECTOR Hank Janowsky

MARKETING
MARKETING MANAGER Allan Rubin
CONFERENCE DIRECTOR Janet Allen
ASSISTANT DIRECTOR - CONFERENCE SALES Justine Wood
CONFERENCE REGISTRAR Susan Cuevas
EXHIBIT SALES Billi Famiglietti

CIRCULATION
CIRCULATION DIRECTOR Sylvia Sierra
ASSISTANT CIRCULATION MANAGER Dainia Gamman
FULFILLMENT DIRECTOR William Wynne
LIST SALES Susan Incarnato
READER SERVICE COORDINATOR B. David Fisher
Subscription/Client Services—(800) 777-5006

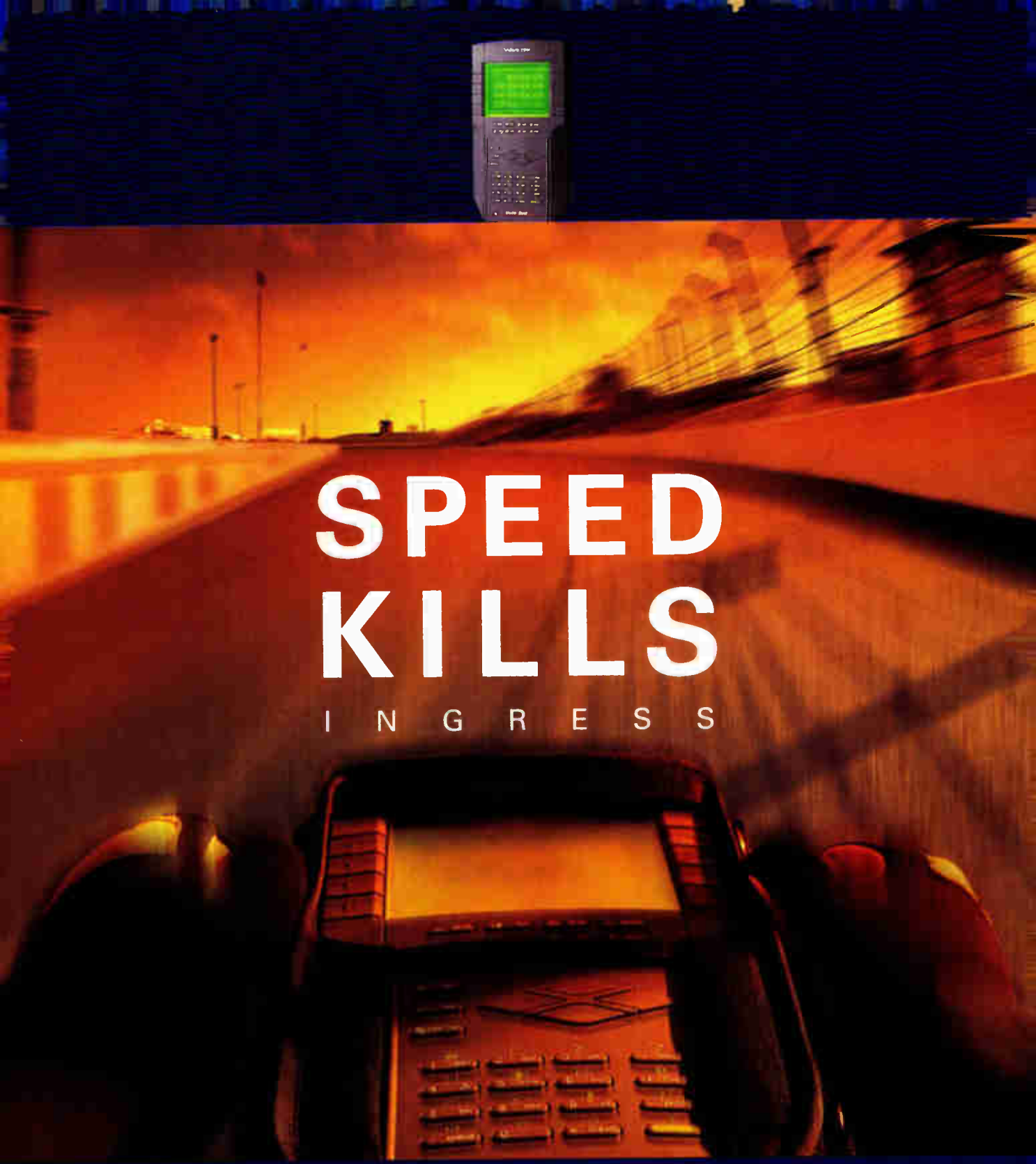
PBI MAGAZINE, TRADE SHOW & CONFERENCE GROUP
SENIOR VICE PRESIDENT David Shaw
VICE PRESIDENT & GROUP PUBLISHER Scott Chase
ASSISTANT VICE PRESIDENT & GROUP BUSINESS MANAGER Kathleen De Franco
ASSISTANT VICE PRESIDENT & GROUP EDITORIAL DIRECTOR David Jensen
DIRECTOR OF MANUFACTURING AND DISTRIBUTION Maxine Minar
GROUP MARKETING DIRECTOR Anne Coffey
DIRECTOR, NEW VENTURES Debra Vadenos
MANAGER OF COMPETITIVE INTELLIGENCE Judy Lawrence
ADMINISTRATOR Evie Sanchez

PHILLIPS BUSINESS INFORMATION
CHAIRMAN Thomas L. Phillips
PRESIDENT Thomas C. Thompson
SENIOR VICE PRESIDENT—Magazine, Trade Show & Conference Group, David Shaw
SENIOR VICE PRESIDENT—News & Information Group, Edward Hauck
VICE PRESIDENT—Information Research Group, John O'Brien
SENIOR VICE PRESIDENT—Finance, Frederick Moses
SENIOR VICE PRESIDENT—Eliot Minsker

CT PUBLICATIONS CORP.
A division of Phillips Business Information Inc.
CT Sales and Editorial Offices
1900 Grant St., Suite 720, Denver, CO 80203
(303) 839-1565 Fax (303) 839-1564

CORPORATE OFFICES
Phillips Business Information Inc.
1201 Seven Locks Road, Suite 300, Potomac, MD 20854
(301) 340-2910 Fax (301) 340-0542
Magazine Group: toll free 888-340-5075

Website: ctinfosite@phillips.com



Got a problem with ingress and noise? Then run 'em down with Wavetek's new StealthTrak™. It's twice as fast — giving you outstanding accuracy with high-speed performance. Plus, you can now track down ingress. With Wavetek's Stealth Trak™, you'll get some new standard features, like faster spectrum displays, a built-in low-pass filter and preamp, an impulse noise detector and more data storage. And you'll get new, expanded digital features as well. You'll also like the fact it's compatible with Wavetek's 3ST and 3HRV transmitters, so you'll save time and money down the road. Let's face it, the new StealthTrak™ is nothing less than a high-performance machine. So call Wavetek today at 800-622-5515 or 317-788-9351 or visit us on the Web at www.wavetek.com. And satisfy your need for speed.

RETURN PATH OUT

WAVETEK

Reader Service Number 8

PULSE

By Greta Durr

Comcast Frees Jones from BCI

In the wake of a successful attempt to thwart Jones Intercable's Internet Channel's expansion in court, British Telecom Holding (BCI) opted to sell its 30% stake in the MSO and a chunk of itself to Comcast.

Comcast announced it will pay the Canadian telephone company $500 million over the next few years for a 30% stake in Jones. The first phase of the deal also will buy Comcast a 49% interest in BCI.

By 2001, Comcast can exercise an option to purchase an additional 2.9 million shares of stock from company founder Glenn Jones. Those additional shares would give Comcast a 37% stake in Jones and potential for controlling the MSO's board of directors. Another option would grant Comcast the remaining 51% of BCI.

Jones officials were unavailable at press time to speculate about what bearing Comcast's @Home presence might have on the future of the Internet Channel.

Zenith to File Chapter 11

Zenith's outlook for the future and new Multimedia Cable Network System (MCNS)-compliant cable modem were dimmed by bad publicity when the company decided to file Chapter 11 bankruptcy this fall, said Zenith spokesman John Taylor. The electronics pioneer subsequently was removed from NYSE listings. Taylor said the restructuring plan emphasizes technology over manufacturing.

Infusions of cash from LG, a Korean firm with a 55% interest in Zenith, and attempts to combat losses associated with restructuring have not succeeded, according to Zenith's May SEC filing.

By April, Zenith had nearly $377.5 million in interest-bearing loans from LG, Citicorp and various unsecured and uncommitted creditors such as Bank of America, Credit Agricole, First Chicago NBD and Societe Generale.

S-A's RF Amplifier Niche Challenged

ADC Broadband Communications officials say their new Pathworx RF amplifiers are so advanced, no one in the marketplace can compete.

The Pathworx line uses wireless technology for remot, local monitoring and digital control with real-time display. The 870 MHZ trunk-bridger amplifiers and high-gain bridger amplifiers have expanded bandwidth to meet network requirements.

The wireless unit is a hand-held device that allows technicians to perform system sweeps and make network changes without even getting out of the truck, never mind climbing a pole, said ADC RF Amplifier Division Vice President Robert Burkholder, who joined ADC last year after a decade with Scientific-Atlanta.

Such convenience, he said, could force competitors such as Scientific-Atlanta to redesign their products. S-A officials disagree.

"I'm not surprised by ADC's attempt to branch into this niche market," said Mark Palazzo, a vice president of S-A's RF Electronics Unit. S-A has installed 3 million amplifiers over the past quarter century, he said.

S-A investigated the same approach some time ago, said Palazzo, but opted for a different strategy.

"Our approach is not to save $2 million to $3 million on truck roll-outs, but to eliminate the need for that all together," he said.

Although they didn't yet have a buyer for Pathworx at press time, ADC officials are hoping to keep Pathworx technology under wraps as long as possible. That can be a tricky feat, Burkholder said. He once nabbed an engineer with a pocketknife at a Society of Cable Telecommunications Engineers Expo, prying open a black box for a better glimpse at the technology. ➤

PDI STEREO MODULATORS

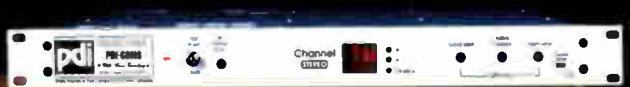
OUT OF THIS WORLD VALUE

PDI's stereo modulators are nothing less than a symphony of excellence. Our patented, state of the art, super high performance stereo encoder is available for all PDI modulators. This offers the cable operator the widest range of cost flexibility available from one manufacturer.

All PDI stereo modulators provide a minimum of 26 db sound separation as well as pro-logic surround sound. Each unit comes with a **four page test report**, a **five year warranty**, and is Canadian/UL listed.

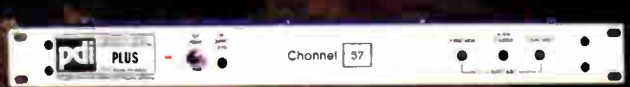
Here's some additional music for your ears. PDI stereo modulators are **hundreds of dollars less** than other high performance stereo modulators.

This exceptional product line has won critical acclaim from a significant number of MSO's nationwide. Won't you call us today for your test and evaluation unit? You will soon determine that PDI headend electronics are truly an out of this world value!

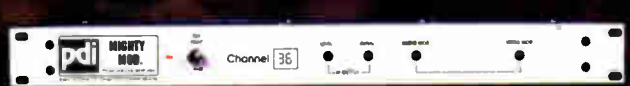


PDI-60MS 550 MHz 60dBmV Agile Modulator

PDI-60CMS 550 MHz 60dBmV Fixed Channel Modulator



MIGHTY MOD™ PLUS 550 MHz 55dBmV SAW Modulator



MIGHTY MOD™ 300 MHz 55dBmV PLL Fixed Channel Modulator

pdi telecommunications

PDI - Boca Raton, Florida
(561)998-0600 1(800)242-1606
Fax:(561)998-0608 www.pdi-eft.com
PDI.Electronics@worldnet.att.net

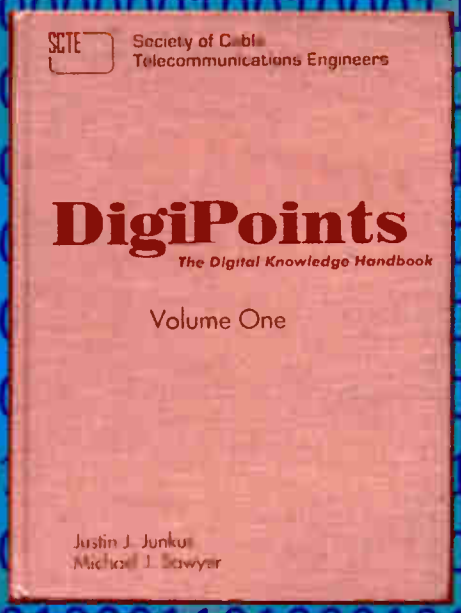
PDI SouthWest
(210)641-6417
Fax:(210)641-6418
pdi-sw@texas.net

Canadian Distributor
Capella Telecommunications Inc.
1(705)748-3255

Peruvian Distributor
SATEL S.A.
(511)446-2253

Colombian Distributor
ETEK de Colombia S.A.
(571)635-3700

Reader Service Number 10



LEARNING BY NUMBERS

NOW AVAILABLE FROM SCTE: DIGIPOINTS VOLUME ONE
A COMPLETE MANUAL, OFFERING TECHNICAL TRAINING ON:

CHAPTER 1: BECOMING DIGITALLY KNOWLEDGEABLE
CHAPTER 2: MODEMS
CHAPTER 3: ANALOG TO DIGITAL AND BEYOND
CHAPTER 4: BANDWIDTH MANAGEMENT
CHAPTER 5: GROWING CAPACITY THROUGH TECHNOLOGY
CHAPTER 6: ERROR DETECTION AND CORRECTION
CHAPTER 7: DATA COMMUNICATIONS PROTOCOL
CHAPTER 8: DIGITAL COMPRESSION
CHAPTER 9: DEFINING NETWORK ARCHITECTURES
CHAPTER 10: LOCAL AREA NETWORKS
CHAPTER 11: NETWORK INTERCONNECTION: ACCESS PROTOCOLS
CHAPTER 12: PUTTING IT ALL TOGETHER

TOGETHER, THESE 12 CHAPTERS COMPRISE THIS HIGH-QUALITY MANUAL, WHICH ANSWERS AN EVER-INCREASING NEED CURRENTLY FACING CABLE TELECOMMUNICATIONS PROFESSIONALS:

TO BECOME PROFICIENT IN DIGITAL TECHNOLOGY.

To Order:
All orders must be prepaid. All prices are in U.S. dollars. Checks must be drawn on U.S. dollars. Banks in USS. SCTE accepts MasterCard, VISA and American Express. SCTE prefers credit card orders for foreign shipments. In order to qualify for SCTE prices, a valid SCTE member number is required or a completed membership application with dues payment must be included with this order. Orders received without an SCTE member number will be charged full nonmember prices. Rush orders add $15 surcharge plus overnight delivery cost. No cash refunds.

MAIL TO: SCTE, 140 Philips Road, Exton, PA 19341-1318, or FAX with credit card information to: 610-363-5898.
SHIP TO: Name: _____
Address: (NO P.O. BOXES): _____
_____
Phone: ____-____-____ Date: ____/____/____ Member #: _____

❑ Please send me the following item in the quantities indicated:
_____ copies of TR-33, *DigiPoints Volume One* ❑ Member: $45 ❑ Nonmember: $54

❑ A check or money order in U.S. funds for the appropriate amount shown above and made payable to the Society of Cable Telecommunications Engineers is attached.

❑ I wish to pay by credit card (please check one). ❑ MasterCard ❑ VISA ❑ American Express
Account Number: _____ Expiration Date: ____/____/____
Signature: _____ (Pennsylvania residents add 6% sales tax).

CableServ provides proven, cost effective, reverse path solutions.

The cable industry keeps evolving. System requirements keep expanding. And your bandwidth needs to keep up. Where do you turn?

If you're like our U.S. and Canadian customers, you call CableServ. Since 1986, we've been engineering innovative, customized solutions that dramatically expand and upgrade the performance of existing cable equipment -- without a costly system rebuild.

CableServ offers turn-key solutions to upgrade your present G.I., S.A., and Philips equipment to 5-40 MHz. Our 20,000-square-foot facility -- with top-notch engineering, design, testing and QA capabilities -- makes it happen. Our obsession with customer service is moving us towards achieving our ISO9001 certification.

Expanding your cable system performance doesn't necessarily mean a full-scale rebuild -- we have a better way. For solution engineering, Call CableServ, at 1-800-668-2033, or e-mail us at *inquiries@cableserv.com*. And visit our Website at *www.cableserv.com*.

CableServ Electronics Ltd.®, 1020 Lawrence Ave. West, Suite 201, Toronto, Ontario, Canada M6A 1C8

Reader Service Number 11

Broadband on the Run

A new market opens for operators when the @Home Network launches a new high-bandwidth platform to allow subscribers remote access to CD-ROM media.

Officials from @Home said they're optimistic that the new technology will enhance service to subscribers and capture a slice of the CD-ROM market.

The platform, developed in cooperation with Massachusetts-based Arepa Inc., allows @Home users remote-access CD-ROM content without downloads, cumbersome installations or additional hardware.

Arepa also has formed alliances with MediaOne, US West Media Group and Fidelity Capital to promote the broadband software platform for cable modems, digital subscriber lines (DSL) and wireless networks.

News Bites

- Sprint announced a new network architecture built with partners Cisco, Bellcore and RadioShack. The Integrated On-Demand Network (ION) uses asynchronous transfer mode (ATM) packet switching over a high-speed synchronous optical network (SONET) transport layer to provide simultaneous voice, video calls and data services over a single phone line. RadioShack stores will market the service, slated for availability to businesses this year and residential customers by 2000.
- Ray Perez, formerly of Raycom, is the new sales vice president at Passive Devices Inc.
- TCI announced that rivals Microsoft and Sun will be sealed together in the MSO's new advanced set-tops. An expanded agreement allows TCI to use Sun's PersonalJava environment for new set-tops running on Microsoft's Windows CE.
- Correction: The Vendor's Guide in *CT's Technology Profiles 1998* didn't include Convergence Systems, which should have been listed in the cable modems, headend equipment and network management categories. Convergence is at 3950 Johns Creek Ct., Suwanee, GA 30024. Call (770) 416-9993 for more information. CT

Greta Durr is assistant features editor at "Communications Technology" in Denver. She can be reached via e-mail at gdurr@phillips.com.

INGRESS PROBLEMS SLOWING YOU DOWN?

Speed has never been as important in the race to install and maintain your return path as it is today. So the last thing you need is a problem with ingress. That's where the HP CaLan 3010R/H Sweep/Ingress Analyzer comes in.

A comprehensive, flexible field tool.

The HP CaLan 3010R/H is the one tool that does it all—even in the presence of ingress.

- Forward sweep
- Reverse sweep
- Signal-level measurements (including digital signals)

Highlights of the HP CaLan 3010R/H include:

- ***Ingress Detection***
  When ingress corrupts return path communication, the headend unit transmits a display of the ingress image to the field unit for immediate troubleshooting.
- ***Dual Path Sweep***
  New! One headend box for both forward and return sweep means more efficient use of bandwidth, more space in the headend and less equipment to buy.
- ***Digital Power***
  New! Quickly and accurately measures average power of digital carriers—including return path TDMA (bursted) carriers.
- ***DigiSweep Technology***
  HP CaLan set the industry standard with its 5 µs sweep pulse. It's so fast it can pass through active digital traffic without interference. And now our sweep speed is even faster; measurements can be performed in 650 ms.

When speed counts, there's no faster way to activate your return path and troubleshoot ingress than the HP CaLan 3010R/H.

HP CaLan 3010R field unit

For more information call: 1-800-452-4844,* Ext. 5333.

*In Canada call 1-800-387-3154, program number TMU355.

www.hp.com/go/catv

HEWLETT PACKARD

SCTE UPDATE

SCTE Forms Search Committee To Find New President

The Society of Cable Telecommunications Engineers Board of Directors has formed a temporary search committee to identify a chief staff executive who will assume Bill Riker's presidential duties upon his resignation.

The committee, led by SCTE Region 12 Director John Vartanian of Viewer's Choice, is seeking qualified individuals to oversee all aspects of the Society's Exton, PA-based operation. A successful candidate will possess profit-and-loss responsibility, operating proficiency, technical expertise, industry knowledge, demonstrated marketing skills and evidence of leadership. He or she should be skilled in developing cross-industry cooperation and consensus-building.

Vartanian said of the committee's search: "Over the years, SCTE membership has experienced extraordinary growth. We're looking for a highly qualified person to continue the Society's development."

Committee members, who include Vartanian, SCTE Board Chairman Steve Johnson of Time Warner Cable, Dan Pike of Prime Cable, Alex Best of Cox Communications, Rex Porter of *Communications Technology* magazine and Riker, will be responsible for identifying and initially evaluating viable candidates, from both inside and outside the SCTE, and making recommendations of the top choices to the board.

Johnson commented: "Bill Riker has done an outstanding job of running the Society for almost 14 years. Finding his replacement will be a difficult task. The SCTE Board of Directors is moving quickly to find a new president, however, and has established this committee to do the legwork and filtering process to expedite this operation."

Interested candidates should mail résumes with cover letters in confidence to: Search and Screening Committee, c/o SCTE, 140 Philips Road, Exton, PA 19341, or e-mail to: search.committee @scte.org.

The full SCTE Board of Directors will make the final hiring decision.

SCTE Announces 1998 Winner Of Shapp Scholarship

The SCTE is pleased to announce that Brent Lutz is the recipient of this year's Milton Jerrold Shapp Memorial Scholarship Award.

Lutz, a senior at Smoky Hill High School in Aurora, CO, was selected from a pool of nearly 40 applicants to receive the $20,000 grant ($5,000 per year for four years) based on his exemplary academic performance and community involvement.

"I am very grateful to SCTE (and General Instrument) for choosing me for this honor," Lutz said. "The award is very generous and helpful to me in my coming college years."

The son of longtime SCTE member Dale Lutz of BTN Engineering and Design, Lutz maintained a 3.8 grade point average, scored 1,550 on his SAT exams and graduated in the top 5% of his class. This National Merit Scholar has participated in his school's International Baccalaureate and peer counseling programs, maintained membership in both the National and German Honor Societies, and is a member of the school's lacrosse team.

Lutz comments on his success: "My parents, with their expectation of high standards, have pushed me to my potential more than anyone. Furthermore, the multiple inspirational and motivational teachers I have had in the past years have not only made learning the greatest pleasure but given me a great

Compatibility

"My hybrid fiber/coax system is a mix of four different equipment manufacturers from the headend out. Where can I find a compatible network monitoring system?"

AM MONITORED AM DEPENDABLE

Take Two Aspirin And Call In AM

AM Communications' OmniStat™ end to end HFC network monitoring system is compatible with all major brands of cable transmission equipment. With hundreds of systems installed worldwide and over 500,000 units in the field, AM has become the preferred OEM provider for major manufacturers – providing cable system reliability for every brand or combination of brands of broadband equipment. It's what you expect from an industry pioneer with a fifteen-year record of providing quality network monitoring systems.

But compatibility is only one of the many problems facing you today. The best way to prevent cable system headaches is to call in AM before they start. AM's OmniStat system monitors headend, optical equipment, amplifiers, power supplies and end of line performance. OmniStat can be customized so that it meets the most demanding needs of your cable system making it a solid foundation for integrated system management that is modular, expandable and cost effective. All of this and an easy-to-use Windows environment means you can forget the aspirin – and the headaches.

OMNiStat

AM COMMUNICATIONS
The cure for cable system headaches

100 Commerce Drive, Quakertown, PA 18951-2237 • 800.248.9004 • www.amcomm.com

Reader Service Number 16

advantage for the future."

Lutz plans to attend the Colorado School of Mines in Golden, CO, where he will study chemical engineering and economics.

This award, sponsored by General Instrument (formerly known as Jerrold Electronics and NextLevel Systems) and administered by SCTE, was established in 1996 in memory of the company's founder, former Pennsylvania Governor Milton Jerrold Shapp. The scholarship recognizes independent thinkers who demonstrate the same ambition, community activism, determination and entrepreneurial spirit exemplified by Shapp's life and accomplishments.

For more information about the Shapp scholarship, contact SCTE national headquarters at (610) 363-6888 or visit the SCTE Website: http://www.scte.org.

DigiPoints Volume One Available

Digital training just became easier with the release of the SCTE's new book titled *DigiPoints Volume One*.

Jay Junkus and Michael Sawyer, both of KnowledgeLink, in collaboration with the SCTE training department, have developed a complete guide to understanding the digital technology used in broadband telecommunications. This newest addition to the SCTE technical training library encompasses the first 12 chapters of the Society's exclusive digital training manual and helps cable telecommunications professionals become proficient in this challenging technology.

"*DigiPoints* is an extremely valuable learning tool," said Junkus. "It addresses the growing need for quality training in digital communications because that's where our industry is headed."

This theory-based handbook covers such topics as network architecture, local area networks (LANs), modems, access protocols, error detection and correction, digital compression and more.

Each chapter includes practical application exercises to aid in the learning process.

SCTE members can now purchase *DigiPoints Volume One* for just $45. Nonmember price is $54.

For more information about the Society's training materials, contact Product Fulfillment at (610) 363-6888 or fax to (610) 363-5898. Updated information also can be found on the SCTE Website: http://www.scte.org.

The SCTE is a national non-profit professional organization serving the broadband industry's technical community. SCTE currently has more than 13,500 national members from the United States and 70 foreign countries and offers a variety of programs and services for the industry's educational benefit.

SCTE has 72 chapters and meeting groups and has technically certified more than 3,000 employees of the cable telecommunications industry. CT

WHAT DO ALMOST 500

Cable Operators Already 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

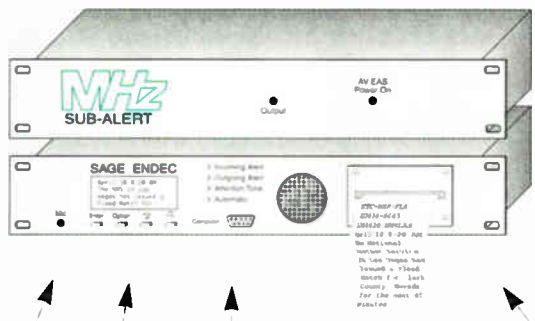
NO Computers or controllers Required

6 Monitoring Inputs

Ease of Installation

Low Cost

Highest Technical Specifications in the Industry



Compatible with Existing SA CommAlerts, Iris Routers

Selective Channel Switching By Event

FCC Compliance Guaranteed

Elimination of NOAA 1050 Hz Tone

Non Interfering

Remote Hub Site Control

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

Now With Multiple or All Channel Crawl!!

No Bandwidth Limitations

Red, Green, Yellow Alerts

Don't Be Fooled
All EAS
are not cre
qual

MHz MEGA HERTZ®

Established 1975

http://www.megahz.com

"Unique" Products For the 21st Century!

DENVER ,CO
800-525-8386
FAX 303-779-1749

ATLANTA, GA
800-962-5966

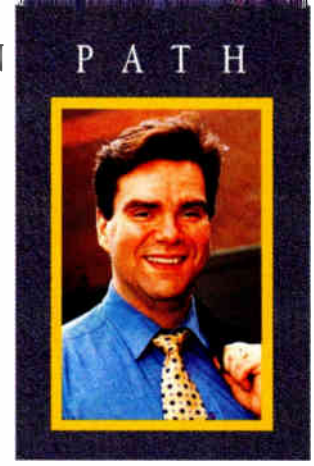
ST. LOUIS, MO
800-821-6800

OCALA, FL
800-922-9200

INDIANAPOLIS, IN
800-761-7610

PHOENIX, AZ
800-883-8839

Reader Service Number 18



By Alex Zavistovich

Deliver the Goods

Monica Lewinsky's former lawyer William Ginsburg sure got a lot of face time on television, but that didn't keep him from being canned for somebody better. There's a crucial life lesson: Being "high profile" isn't enough—you have to deliver the goods. Americans can't stand someone who can't deliver the goods.

Cable operators have to be sure they have everything covered before offering a service like high-speed data. Many operators planning to offer data services have been advised to outsource customer service and support. In data, supporting the cable modem at the customer premises is key. You will need to outsource. Just be careful who you have representing your company.

Customer service fun

A couple weeks ago, I had a grisly encounter with inept customer service. It was with a computer chain some cable data service providers use for installations at customer premises. I'm not naming names here; let's just call them "Computer JumboMart."

Trying to use my on-site service plan meant calling the Computer JumboMart customer service line something like *12 times*. I initiated every call and got the same story each time: "The first rep got your complaint wrong, so we've talked to the right store now, and they'll call you in two days to tell you when they're coming." Here's what it's like living life two days at a time:

Them: "I've noted the problem. Someone from the right store will call in two days."

Me: "You said that two days ago. What happens if they don't?"

Them: "You should call this number again and talk to a rep."

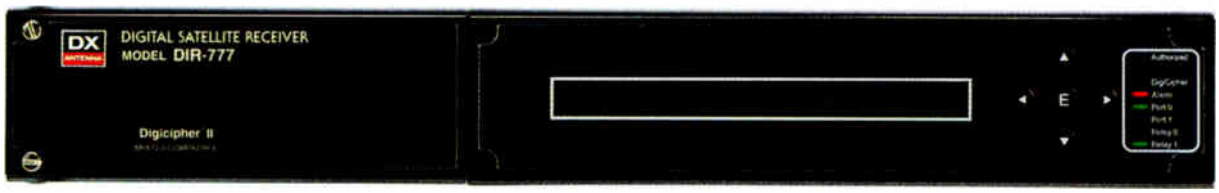
Me: "And they'll send someone out?" ➤

DX
ANTENNA

It Can Receive Satellite Signals In A Microsecond.

Sending It To You, However, Takes A Full Day.

The DIR-777
DigiCipher® II Digital Satellite Receiver



INTRODUCING DX COMMUNICATIONS QUIKSHIP DIGITAL SOLUTIONS.
ORDERED TODAY. DELIVERED TOMORROW.

For years, you've trusted DX for the finest satellite reception products and we've always delivered. Now, with the introduction of our first digital line, DX provides a comprehensive, one-stop solution for all your analog AND digital needs. The DIR-777 represents a powerful addition to your headend configuration— the next generation in a long line of breakthrough products from DX, the world's leading supplier of CATV delivery products. For pricing and vital statistics, call DX Communications now. DX Communications, at the leading edge in digital reception.

DX Communications: 1143 West Newport Center Drive Deerfield Beach, Florida 33442 (888) 293 - 5856

DX Communications is a Division of Itochu Cable Services Inc.

Reader Service Number 20

Them: "No. They'll have someone from the store call you."
Me: "How long will that take?"
(*Everybody, say it with me*)
Them: "About two days."

I had to call the main office of Computer JumboMart and talk to the customer service director of the entire chain to get something done! (That's when I learned that the chain doesn't employ its own service reps; they outsource the whole thing to another company. Your service agreement may say Computer JumboMart, but the service call goes to Granny Blue Hair in a sweatshop office in West Trailer Park, Nowhere, USA.)

Anyway, so I strong-armed this corporate suit. He leans on the "right store," and someone finally calls to say they'll send someone over (in about two days) sometime before 10 a.m. At 10:30, I get a call from the "right store," saying the technician has just called in sick. That's a half hour *after* he was supposed to be at the house.

Pointing out this odd sequence of events in my typical even-tempered manner, I inquired in a measured, reasonable way, "Why the hell don't you fire this idiot?" The response was about what I expected by now: "He's the only one we've got."

A sense of purpose

Finally, the customer service brain trust decided to call a courier to pick up the computer—*rush*. Now we were getting somewhere. This was all very official-sounding. Purposeful, even.

Four hours later, Mr. Speedy Delivery shows up, a purposeful example of the best of the couriers' profession, striding purposefully to my front door and purposefully ringing the doorbell. With his purposeful zipper down, and his shirttail sticking purposefully out.

Into these hands I commended the body of my poor computer, deprived of appropriate care for two full weeks because of inept customer service.

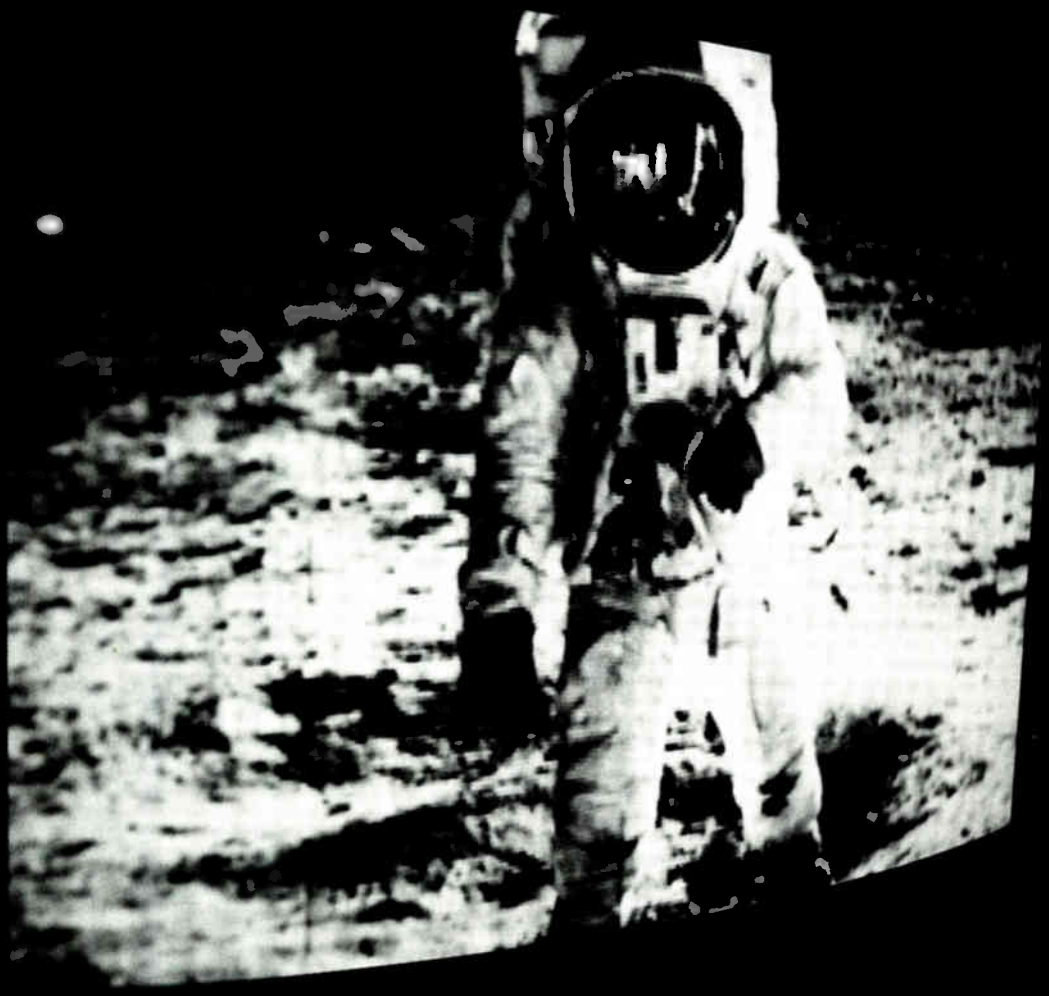
Two weeks with no computer. Can you imagine what a home business is these days with no computer? I know people who'd almost rather go two weeks without a head.

Now, imagine you're offering data service and something goes wrong with a customer's cable modem. Who do you think they'll blame if they can't use their e-mail or Internet access for two weeks? Not Computer JumboMart. *You*. They'll remember the whole story in painful detail: the unreturned phone calls, the missed appointment, the zipper, everything. They'll tell the story to anyone who'll listen. And when they get tired of telling it, they'll write it down.

Cable has worked hard to get over its reputation for providing poor customer service. The last thing the industry needs is to be torpedoed by bad outsourcing.

You may not be able to handle the customer's computer on your own, but make sure that your contractors can. It's all on you. You've made a promise; you need to deliver the goods. CT

Alex Zavistovich is executive editor of "Communications Technology." He can be reached in Potomac, MD, at (301) 340-7788, ext. 2134.



APOLLO 11, 1969

MAKING SURE YOU GET THE PICTURE

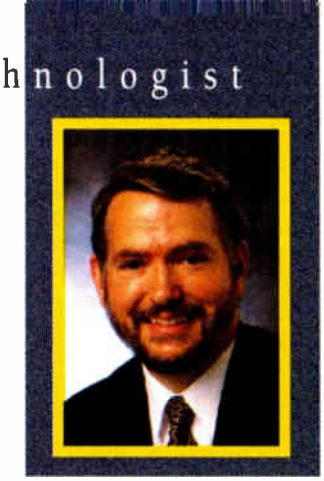
First man on the moon. The whole planet watches with anticipation. All sharing a wondrous, giant leap in human achievement via cable television systems. Today, our world is rapidly becoming one neighborhood because of the leading-edge, point 2 multipoint network solutions℠ that we design, manufacture and service. Like our Cornerstone® cable telephony technology that adds voice to cable and new revenue to your performance. ANTEC Network Technologies. Getting you the picture. Call us. 770-441-0007 or www.antec.com

ANTEC

Network Technologies

Reader Service Number 22

By Ron Hranac



IP Telephony

What It Is, What It Can Do

A few days before writing this month's column, I had an opportunity to attend a meeting of the Association of Colorado Telecommunications Professionals. The subject of the meeting was "IP Telephony: The Next Wave?" It featured speakers from several major telecommunications firms. The speakers didn't go into a lot of detail about the mechanics of IP telephony (by the way, the "IP" in IP telephony stands for "Internet protocol"), tending to focus instead on general business opportunities and what their particular companies are doing or planning to do with IP telephony.

So just what is IP telephony? Well, it's not necessarily telephone communication via the Internet, although this certainly is considered a form of IP telephony. In general, IP telephony is the transmission of voice over a packet switched, IP network. OK, then, what is an IP network, and what is Internet protocol? A sidenote here: When implemented on an individual private basis, it's referred to as an "internet," with the "i" lowercase. This also is called an "intranet." When referring to *the* Internet, the "I" is uppercase.

Network layers and packets

You've probably heard of TCP/IP, or transmission control protocol/Internet protocol. When talking about networks, it's possible and often desirable to evaluate them by layers. Many moons ago, the International Standards Organization created a seven-layer reference model known as the open-systems interconnection (OSI) model.

The seven OSI layers include physical, data link, network, transport, session, presentation services and application. The first two, physical and data link, sometimes are referred to as lower level protocols, and the remaining five are upper layer protocols. TCP/IP is considered an upper layer protocol; well, actually a suite—or collection—of protocols.

> "IP telephony is the transmission of voice over a packet switched, IP network."

TCP operates at layer four and is a transport protocol, while IP is at layer three and is a network protocol. In a nutshell, IP routes packets from source to destination. These packets, or units of data, sometimes are referred to as datagrams. An IP packet or datagram is a basic unit moved through a TCP/IP network such as the Internet. In 1983, the U.S. Department of Defense formally adopted TCP/IP as the standard protocol—OK, protocol suite—to use when connecting to the ARPANET (Advanced Research Projects Agency network), which was the predecessor of today's Internet.

IP is considered to be connectionless and implements two basic functions, fragmentation and addressing. Fragmentation (and re-assembly at the other end) sometimes is necessary when packets need to be reduced in size for passage through a network that uses small packets. Addressing simply is defining the source and destination address. Both functions, fragmentation and addressing, are implemented in the IP header. The IP header includes several other components, but I'll save that discussion for another time. So, bottom line, IP is a network protocol, sort of like its name suggests. An IP network is a network that is based on IP.

The neat thing about IP is that it can be used on just about any type of transport media. This includes the Internet, private networks, local area networks (LANs), traditional dialup modem connections, cellular and so forth. In fact, a couple of the speakers at the ACTP meeting I mentioned earlier were from companies that are building their own fiber-based IP backbones to connect major U.S. cities.

These companies intend to provide a full range of business information services via their IP networks, including IP telephony. Some Internet service providers (ISPs) already are providing IP telephony via the Internet. To date, there are an estimated 200,000 IP telephony users.

Placing an IP call

Let's say you want to place a long distance call via an IP telephony provider. One way to do this is to dial into an ISP

Until Every Day Is Sunny And Dry, There's Eagle Elite Traps.

Every Eagle trap is designed and built to last longer and perform better than any other trap on the market. In the toughest environmental conditions. And, we have the patents to prove it.

Our patented Double-D outer shield, our patented dome seal, and our technologically superior O-ring seals provide extraordinary environmental stability. Plus our patented shift tuning process and our patented, shielded, single circuit board ensure that our traps work the way they were designed to. From the first trap in the production run to the last.

More than 20 years of technological innovation go into each filter, making Eagle Elite the most reliable trap on the market. Find out how Eagle reliability and performance can work for you.

Call Eagle at 800.448.7474 or 315.622.3402 or fax us at 315.622.3800. You can also check out our web site at www.eaglefilters.com.

EAGLEelite™ SERIES

Reader Service Number 23

point of presence and establish a dialup Internet connection. PC-based Internet telephony software emulates a telephone, and your "call" is routed to the closest gateway. That is, your initial call is a local call made through the regular telephone network.

A T-1 interface provides the connection between the public telephone network and the ISP's gateway. The gateway takes care of signaling, packetizing, buffering and conversion from compressed to uncompressed formats and vice-versa. Your local call essentially is converted to IP packets for transport over the IP network.

A call processing server on the network establishes the "call" and routes it to the remote (destination) gateway where the process I just described is reversed. The call processing server also keeps track of calling and called numbers, and call duration for billing. This type of "long distance" service presently goes for about seven cents per minute, 24 hours a day, depending on the provider. It's also a lot less complicated to use than it sounds.

The companies that are building their own cross-country IP networks are establishing a metropolitan area infrastructure (MAI) in each of the major cities served.

> "The neat thing about IP is that it can be used on just about any type of transport media."

That MAI includes a gateway to their national IP network and interfaces to the Internet, the local telephone company, long distance carriers and even direct connections to end-user buildings. For the short term, expect long distance voice and fax services by the end of this year or early next year.

Future directions

It was interesting to listen to each of the ACTP meeting's speakers talk about the business of IP telephony. One of the speakers stated that "Internet protocol networks are the most important development in communications since the telephone replaced the telegraph." He went on to say that, over time, IP networks will displace public voice networks. Hmmm, a bit optimistic perhaps.

One of the other speakers was, in my opinion, more realistic when he said, "The PSTN (public switched telephone network) and IP telephony networks ... will coexist." The first guy must have been from his company's marketing department.

Anyway, once past the hype, all of the speakers brought up a number of potentially exciting ideas about what role IP networks will play in telecommunications.

One of my favorites was a so-called Internet reach-me service. Here's how it might work. Suppose you want to contact a colleague, and your first stop is her personal Web page. On that Web page would be a series of point-and-click buttons. One button will call her cellular phone; another will allow you to send text to her pager; the third one is used to send her a fax; the fourth one is for e-mail; and the last one will enable you to reach her at her current location.

Neat, huh? All of this can be done using IP networking, with IP telephony a subset of that technology.

Transport

Because IP telephony is transport independent, our cable networks can easily be one of the transport media. After all, we've been upgrading our systems to handle cable modems and other data traffic, so why not throw in a little IP telephony to go along with the services we offer our subscribers?

This was mentioned briefly at the meeting, but it was obvious that the speakers were not really familiar with the cable industry. (They even admitted it.) IP telephony may be an alternative for us to consider in the area of providing telephone service via our networks, perhaps in concert with some of the players now building national fiber-based IP network backbones.

Quality

Some have argued that IP telephony is not of sufficient quality to be competitive with traditional telephone service for commercial applications. This may have been true early on, and probably still is true to some degree for Internet-based IP telephony, but private IP networks really don't have a problem with Quality of Service (QOS).

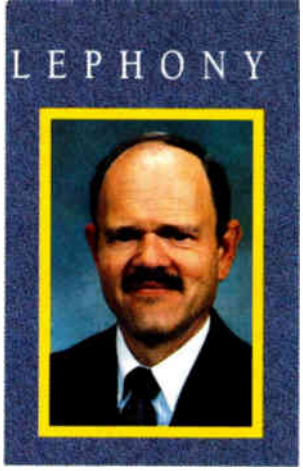
The quality of IP telephony is determined by two key factors: latency (end-to-end delay) and the amount of packet loss that occurs. Near toll quality voice calls require less than 300 milliseconds of delay and no more than 5% packet loss. Voice calls actually can tolerate much worse conditions (up to 500 milliseconds of delay and 25% packet loss), and digital signal processing algorithms can help to compensate.

For personal long distance calls, no problem. Unfortunately, where QOS is required, the latency and high packet loss that can occur on today's Internet backbone are not good enough. That's where private IP networks stand to do well. And frankly, I think there might be something here for our industry, too.

By the way, if you're interested in more information about TCP/IP and other networking technology, I suggest you check out *The McGraw-Hill Internetworking Handbook* by D. Edgar Taylor (McGraw-Hill Inc., 1995, ISBN 0-07-063263-4). This 770+ page book retails for about $80, and contains a wealth of information. CT

Ron Hranac is senior vice president of engineering for the Denver-based consulting firm Coaxial International. He also is senior technical editor for "Communications Technology" magazine. He can be reached via e-mail at rhranac@aol.com.

By Justin J. Junkus



In a Local Telephony Switch, The Money Is in the Features

In telephony, hardware is nice to have, but it's sort of like a drill. No one really buys drills. Holes are what you buy, and the drill is just an intermediate step in the process. The same holds true for telephony switches. A system operator might buy a local telephony switch to establish connections between subscribers, but this is just the beginning. The switch software provides features, and features are what ultimately will make the subscriber choose service from the system operator over the telco.

"What about price?" you may ask. It is true that one way to enter a market is to undercut the competition's price, but this usually is self-defeating. The incumbent has a large base of subscribers and can match or beat any price. Worse still, this is one case where governmental regulators probably would be sympathetic to a price war—after all, the consumer is receiving the benefit of lower-cost service.

Marketing

So back to features as the solution to market penetration. Most cable operators getting into the telephony business have a good start on understanding how this works. MediaOne, for example, offers a two-line package, with one of the lines equipped with multiple features, including call waiting, call forwarding, call transfer and conferencing. The second line is pure POTS (plain old telephone service) and generally is pitched as a teen or data line.

I question whether any self-respecting teen nowadays would accept POTS-only service as an option, but that's just the personal observation of a dad with four phone lines into the house. MediaOne appears to agree with me on this point, since they offer an upgrade of the second line to the premium features for a small additional monthly fee. By the way, marketing that second line for data access makes sense even if you offer high-speed data service, since some users' laptops from the office may not be equipped with network interface cards (NICs) to hook up to a cable modem.

> "It is true that one way to enter a market is to undercut the competition's price, but this usually is self-defeating."

Separate features

Now for part two of "Marketing Telephony by Features." You've sold the subscriber on your initial product offering, and your friendly telco has matched your offer. At this point, you need to become creative.

To help you, I am going to list and define a few of the more than 300 features available in a typical digital switch and challenge you to think about putting together some combinations that your competition doesn't yet market. The key here is to come up with a new "feature" using existing switch capabilities.

To keep this simple, for now we will limit this discussion to Class 5 local service switches providing residential service. That leaves out toll features and business premises systems such as those found in the central office (to us, headend) Centrex equivalent of private branch exchanges (PBXs). Because those categories also are very important to new business opportunities, we will address them later, in another column.

With that out of the way, here are the definitions of some of what I view as the more useful features available in a typical local digital switch:

Call waiting from originating subscriber: Provides a tone on the line during an active call indicating a second call is arriving. The tone in this case is initiated by the calling party, rather than being a feature that is applied to every call to the line when the line is busy.

Call waiting usually is a feature ordered by subscribers for their own

Without a great system design, you're paddling upstream.

Designing for multi-vendor networks means accommodating tomorrow's interactive offerings and optimizing return on your network investment. These are just two of the things you need to consider when you plan your system's future. Intelligent design is essential for the success of any build or upgrade. GI's System Design Services can help you plan next year as well as the next few decades.

NETadvantage™ System Design professionals get it right the first time. They understand the complexities of open system designs. You get an end-to-end solution, not just a map and a bill. Your design is customized to your goals and includes project management, consultation, quality control and testing. What's more, *NETadvantage*™ designers are experts in network equipment and how it works best with your current system. Only GI has the resources to consistently invest in the brightest people, the latest design tools and state-of-the-art technology.

Get the most for your network investment.
Start smart with a *NETadvantage*™ System Design.
Call 1-800-523-6678 to learn more.

General Instrument
Continuing to make history

Reader Service Number 25

lines. This version, although usually only offered as part of a business system package, makes it possible to send a call waiting tone to another line served by the same switch when your incoming call encounters a busy condition.

Could this be a way to gain the attention of the teen on that second line?

Distinctive call waiting tone: The ability to apply a distinctive ringing or call waiting tone pattern that enables a station user to determine the source of the incoming call. Is that my parents calling?

Multiple directory numbers per line with distinctive ringing: Allows multiple directory numbers to share the same line, so subscribers can receive calls to separate directory numbers without installing additional lines.

Hunting features: Allow lines to be arranged in a hunt group so that, if a line is busy, a hunt of the group will be performed to find and ring the next idle line in the group. Once again, this usually is a business feature, but with the increase in the number of lines in a household, why not consider a residential application?

The following features require the switch to be equipped with local area signaling services (LASS). The LASS feature allows the switch to recover calling and called number information.

Automatic callback: Allows subscribers to automatically call back the last calling directory number associated with their station.

Automatic recall: Allows subscribers to automatically place a call to the last number they called.

Customer-originated trace: Lets the end user initiate a call trace of the last incoming call; useful for identifying originators of threatening or harassing calls.

Selective call forwarding: Allows the subscriber to preselect calls that will be forwarded to another number.

Selective call rejection: Routes calls from specified calling numbers to announcement.

Combinations

Remember my challenge to put together some combinations? Try this one on for size. Your subscriber is a family with a teenage daughter who would like to keep all voice calls on a primary line and reserve the second line for data only. Multiple directory numbers with distinctive ringing is a feature that lets you know which family member is the intended called party, so you don't need to become the answering service for your children (nor they for you.).

How about combining this feature with a call transfer to messaging on busy, such that if you are on the phone when your child's call comes in, it automatically goes to that child's voice messaging mailbox? I'm sure you get the idea, so try some of your own. Feel free to use combinations of other features from your company's telephony switch in addition to those I have listed in this column. You can find these in the documentation that should have come with the switch.

By the way, this isn't just for the marketing folks. A good technical person might be able to come up with combinations that combine maintenance and service. In addition, it may be necessary for a technical staff member either to do some service creation development work using special software tools provided by the switch vendor, or to go back to the vendor to have the work done.

(A word of caution here. Vendors take time to do these "custom" jobs, and your request goes into their development queue along with other features they are considering. The do-it-yourself approach can be a lot faster, if you and your vendor agree on your ability to modify the vendor's software, and your vendor provides you with the appropriate tools and training.)

When you get done with your list, give it to your manager, and send it up to the telephony product manager in your company. How they react will give you some idea about how prepared they are for competition in telephony. While you're at it, send me a copy via e-mail, and I will publish the best combinations. CT

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

NEW PRODUCTS

CATV-27 Standby battery costs only $64.95

Best high temperature battery available!

New high-tech aqueous solution battery normally outlasts valve regulated gelled electrolyte batteries two to one in CATV applications and provides as much as 15% longer run time. By far the best battery value on the market today. Specify CATV-27 Battery $64.95.

Performance Power Technologies

Call toll free today 800-279-6330

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

Self resetting circuit breaker replaces fuses in locations where they blow for no apparent reason causing unnecessary truck rolls. Installs quickly and easily on the output of any type of power supply. Essential for "hardened" fuseless cable systems. Specify SG15B *Surge/Gard* ™ $30.00 (100-up)

Performance Power Technologies

Order today, call 800-279-6330

BATTERY TESTER checks 12 volt standby batteries automatically

Battery Tester checks standby batteries in 10 seconds. Since batteries deteriorate gradually, regular testing with this unique device enables you to log changes in voltage levels as they occur. Having this history lets you know when to do preventive maintenance before a critical battery fails. Specify Model BT1200. Price $275.00.

Performance Power Technologies

Call toll free 800-279-6330.

Performance *CHALLENGER* ™
60V/90V Standby Power Supply

. . . because there is no alternative to reliability.

Reliability is what it's all about when selecting power supplies for your system, regardless of whether they're for an upgrade or a retrofit. Our industry-leading design and reliability assure that our products give years of trouble free service, but that isn't all, our confidence in the integrity of Performance power supplies is so positive, that we back them with a lifetime limited warranty. So call today to find out more about the many benefits of using Performance power supplies. You'll be glad you did . . . for years to come. Phone toll free 800-279-6330. http://www.rfproducts.com/Performance.html.

Performance
Power Technologies

AN EDWIN-ROSS COMMUNICATIONS COMPANY

Reader Service Number 27

By Laura K. Hamilton

They Shoot Pirates, Don't They?

I find it amusing that whenever I explain to someone outside the industry what I do for a living, I quite often get the same flip response. I'll say I'm an editor on a cable engineering publication, and then perfectly nice, respectable people will ask me if I'll show them how to steal cable (wink, wink).

They're joking, of course. Sort of. Somewhere behind their sardonic requests, I sense that they'd be quite interested, thank you very much, if I could and would tell them how to jerry-rig their set-tops or wiring so they could get something for free.

Not that they would do that, of course. Nice people don't steal cable. Well, actually, nice people do steal cable.

When I was in college in the late '80s, I had these two friends of friends who were studying engineering, and just for kicks they'd "fix" your cable box. They'd even do it for free because they fancied themselves as some sort of freeform, free-thinking outlaws thumbing their noses at Faceless Big Business. Give them five minutes and all you'd have to pay for was basic. You'd get all the premium movie channels for free.

I'm not sure how they intended to do it, but I suspect it didn't take much engineering. As I recall, it was more like a nail file, some duct tape and a six-pack of beer.

When these two very nice guys informed my roommates and me that the process destroyed the set-top and you could never return it to the cable company,

The Open Road to Digital Migration

Interdiction

- Digital Ready...Reduced Capital
- Eliminates Piracy
- Reduced Operating Costs
- Lift In Revenue
- Consumers Like It
- Rapid Deployment
- A la Carte Programs

Straight Toward Digital with Interdiction

- Digital Broadcast
- Two Way Services
- Internet Access
- Interactive Programming
- Web Browsing

CAUTION Dead-End Ahead

- Set Top Obsolescence
- Set Top Piracy
- Set Top Buy Through Problems

BLONDER TONGUE LABORATORIES, INC

One Jake Brown Rd., Old Bridge, NJ 08857
(732) 679-4000 • FAX (732) 679-4353
http://www.blondertongue.com

Reader Service Number 29

we chickened out. However, I can't say I didn't think about accepting, and I imagine many of my fellow starving students did.

Of course, it takes more than nail files and tape to be a serious cable pirate—especially today. The digital arena makes filching signals a good deal more complicated, as CableLabs' Claude Baggett shows in his article on page 56 of this issue.

But complexity isn't going to scare off everyone, and it's going to take some time before all the older technologies that are the pirates' favorite playthings are no longer out there in your systems. Simply put, piracy is a lucrative crime, especially when you consider that some estimates have it preying on cable operators to the tune of $5 billion annually.

The silver bullet

Remember the miracle silver bullet hype that even made it into the popular press in the early 1990s? This was the thing that was going to end cable piracy. There were all these newspaper stories about the wizardry of a signal delivered electronically that muddled up pirates' capabilities.

That idea might have had some of them shaking in their boots temporarily until they found a way around it. And maybe it made some of the pirates' customers think twice about purchasing stolen signals for a while. Unfortunately, the hype around the bullet only made thieves more diligent and cocky when they dodged it.

"The pirate industry over the last 15 years has shown a dogged determination to come up with counters to any technology that the industry deploys. So, to rely on technology alone means we're going to be playing a perpetual cat-and-mouse game," says Stan Durey, director of security programs at General Instrument.

So what became of the single silver-bullet theory covered by newspaper stories without clear technical solidity behind them? Well, you really know the truth here. A single solution never truly existed.

"There is no single silver bullet," explains Durey. "Silver bullets are really engineering applications designed to counter various pirate devices. Each one is developed specifically for use in a given system."

Anti-Theft Task Force

So while you're working with your vendors on the technology of tricking thieves, you need to consider other tactics as well. One simple step is to contact the Anti-Theft Cable Task Force. Not only does it support technology measures, but it also offers an anti-theft resource book and kit to local operators. It also selects a cable system to serve as a model for combating signal theft. This system's experience in fighting pirates can offer you obvious rewards. For information on the task force, contact Maggi Walker at (310) 979-4050 or maggiwalker@compuserve.com.

Oh, and as an aside, I sometimes wonder if those two nice guys I knew in college managed to parlay their engineering degrees and unique knowledge of cable set-tops into a career in cable. Hey, if one or both of you is out there reading this—and you know who you are—send me an e-mail. It would make a great story...or maybe not. T

Laura Hamilton is senior editor at "Communications Technology" in Denver. She may be reached via e-mail at lhamilton@phillips.com.

Cost-Effective Systems Transmit Baseband Video/Audio Over Fiber

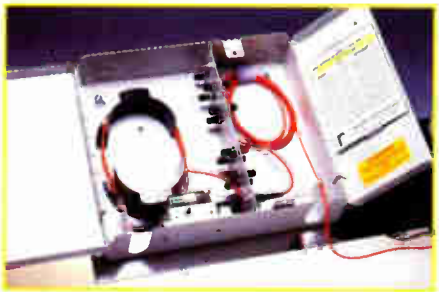
Several cost-effective systems that transmit Baseband Video/Audio over fiber are now available from Radiant Communications. Whether your requirements call for one-way transmission with broadcast quality (RS250), bi-directional systems (two-way) over one fiber, or the new four channel system, Radiant has the solution. Available options include data and stereo audio transmission. These systems are now in use by all the major MSOs.

Reader Service Number 205

Cost-Saving Fiber Optic Control Systems Now Available On One Fiber

Why are you still using leased phone service for communication to remote headends? Radiant Communications has fiber optic systems compatible with all major OEM equipment...GI Omnistar, GI Set Top (TNA), GI Digital Headend, SA Pegasus, Superior Cheetah, AM Communications, Trilithic. All systems are now available using only one fiber and will generally pay for themselves in a few months.

Reader Service Number 206



Fiber Optic Customer Premise Cabinets

Radiant offers a full line of fiber optic cable plant products. Included are heavy duty high security cabinets for customer premise applications. These are double door cabinets with two separate locking mechanisms. Also available are low back reflection assemblies, couplers and WDMs, and the industry's first and best low back reflection attenuators — both fixed and variable.

Reader Service Number 207

FIBER OPTIC ELECTRONIC SYSTEMS FROM RADIANT LET YOU GENERATE REVENUE AND CUT COSTS. THESE SYSTEMS ARE COST-EFFECTIVE AND CAN TRANSMIT UP TO 50 KM.

Ignite the Power Behind Your Dark Fiber

- Fiber optic single-channel baseband video systems ideal for distance learning applications with schools, direct broadcast pick-ups and remote antenna sites. Four channel systems and bi-directional versions also available, providing two-way transmissions over one fiber.
- Fiber optic systems for status monitoring and control compatible with all manufacturers to replace leased phone lines.
- Fiber optic Ethernet systems with high throughput (up to 100 MBS) and no distance limitations (up to 100 Km)...now available on one fiber.
- New high-speed TDM transmits video, T1 and Ethernet at very low cost...VL7000 Supermux.
- Video codec — high quality, low cost product adds video to any digital network — Ethernet, ISDN, ATM, etc.

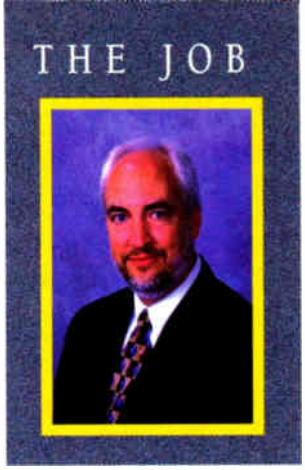
Radiant Communications Corporation
P.O. Box 867
South Plainfield, NJ 07080

1.800.WOW.FIBR
in NJ 908.757.7444
Fax 908.757.8666

Reader Service Number 31

www.radiantcommunications.com

By Alan Babcock



Classroom Teaching Isn't Dead

There has been much discussion about alternative training delivery methods. Individuals and companies have sung the praises of interactive videodisc (IVD), computer-based training (CBT) and now talk of the impact of Web-based training. All of these techniques, and others, stem from attempts to streamline the learning process.

Trainers constantly look for ways to effectively train more people in less time. Employers want people on the job who are instantly successful and competent. It seems there just isn't time to train employees the old-fashioned way—with books and instructors in a classroom.

It is common today to consider classroom training ineffective, inefficient, low-tech and inappropriate for the current work environment. Many believe that new training technologies hold the promise of improving performance, shortening training time and reducing costs.

I long have supported using technology to teach technology. I believe many of the new applications of technology in the training environment can help speed time to competency. I also am convinced that books and instructors in a classroom won't be replaced any time soon.

Classroom benchmark

Indeed, classroom training is low-tech when compared to CBT and other methods, but it need not be ineffective or inefficient. It is prudent to look for new training methods, but we should be aware of the pitfalls and benefits of the various training technologies. Through the next few issues of my column, I will discuss the advantages and potential difficulties of some of the newer training technologies.

Before we look at the new technologies used in the training environment, let's analyze the tried and true standard that, in various forms, has been used to train people for the past several millennia—classroom training. All other training methods will be judged against this standard for efficiency and effectiveness.

Old days, old ways

I suspect that cavemen (cave people in today's politically correct vernacular) probably used classroom training to teach fire building, hunting, berry gathering and other survival skills. I can envision a number of clan members sitting around a campfire watching Thor draw pictures on the cave wall explaining how to hunt saber-toothed cats. Students who didn't pay attention either got thumped by Thor's club or paid the ultimate price when the saber-tooth hunted them. I know this because my 7th grade Social Studies teacher was one of the original Neanderthals—a comment on his teaching style, not my age.

Luckily, classroom training has evolved and improved over the years. We have gone through periods of regression, however. Recall the days of the overly strict schoolmarm with the switch and a rap on the knuckles for failure to memorize the states and their capitals. Remember, too, the pole-climbing instructor who said, "Your check is stapled to the top of the pole—go get it."

Feedback

Most trainers today realize that positive motivation in the classroom is more effective than thumping people with a club. Motivation in the classroom comes in the form of feedback for successful as well as failed attempts at tasks.

The feedback usually is immediate in the classroom environment and can come from peers or the instructor. This feedback is one of the most powerful aspects of classroom training. Students learn to modify improper behavior, and correct performance is reinforced to build competence. It may be more difficult to get this type of feedback from some of the newer training technologies.

Tools

Presentation tools have changed over the eons as well. Imagine Thor's amazement at the use of liquid crystal display (LCD) projectors showing animated hunters and saber-toothed cats (complete with realistic sounds).

Many tools have been created to enhance the visual impact of classroom training. The chalkboard, whiteboard, flipchart, overhead projector, videotape, filmstrip and others have each been created to enhance the messages delivered in the classroom. Each has improved on Thor's original cave etchings.

Use of the proper media enhances the learning activity. The tools we use in the classroom today help make this type of training highly effective. Visual aids can be varied quickly to help adapt the message to the audience. This assures that various learning styles can be accommodated. It also provides flexibility when

questions arise. Many of the new technologies use a one-size-fits-all approach.

Economy of scale

If Thor lectured on berry gathering to one clan member at a time, the others might eat poisonous berries or starve from lack of knowledge about where to search for fruit-bearing plants in the meantime. Classroom training provides an opportunity to maximize the number of people who can receive a specific message.

A trainer can be both effective and efficient by managing class size. Some topics can be delivered to hundreds or even thousands of students at one time. Other programs require smaller class sizes to ensure that each student gets the message. Classroom training can achieve great efficiencies by training many at once. It does suffer from a lack of scheduling flexibility, however, since all students must attend class at the same time. Many of the newer technologies limit the number of trainees to one at a time.

Instructors

Another aspect of classroom training that bears examination is the instructor. This is probably the greatest variable in determining the effectiveness of classroom training. Many of us were taught by instructors like Thor. If we didn't learn, we were smacked upside the head with a club, sent to the principal's office or given an "F" on our report card.

We endured hours of filmstrips, suffered through chalk dust and fingernails on the blackboard and the sweet smell of wet mimeograph ink. I bet all of us, though, also remember a teacher who had that uncanny ability to make us want more. For me, Mr. Neiss was a teacher who had a way of encouraging me to probe deeper, try harder and learn more about electronics. I suppose his looking and acting a bit like George Carlin didn't hurt his ability to keep my attention.

A talented instructor can make the difference between a poor class where little learning takes place and a good classroom experience that produces knowledgeable and competent employees.

Unfortunately, some instructors model their behavior after ineffective role models. Consequently, they themselves become ineffective trainers. Even effective trainers have bad days, make mistakes or otherwise cause problems with classroom training, resulting in lackluster performance by the students. Training technologies that provide the same message each time help to eliminate this significant variable in classroom training.

Even the best trainers get poor results when the program design is substandard. Good instructional design involves varied teaching methods targeted at multiple learning styles. This is true of classroom training, CBT, Web-based training and other methodologies.

> "I can envision a number of clan members sitting around a campfire watching Thor draw pictures on the cave wall explaining how to hunt saber-toothed cats."

Staying power

Classroom training has been around for a long time and won't go away soon. Part of the reason classrooms and instructors exist today is that the method has proven effective over many centuries. Techniques have been modified, tools have been created and program design has evolved to enhance the effectiveness of classroom training. It may not be sexy, but classroom training can be efficient and effective.

I still blame my Neanderthal Social Studies teacher for ruining my penmanship, though. CT

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

ComSonics has done it again!

We've developed new SLM and LEAKAGE standards at the same time!

STANDARD NO. 001

CyberTek™ VISION

The new standard in signal measurement

- Safe, hand free operation.
- Voice responsive.
- Capable of 3rd party enhancement.
- Designed for field use.
- Rugged, waterproof, shockproof.

STANDARD NO. 002

CyberTek™ INGRESSOR

The new standard in leakage/ingress management...

- Intercepts, quantifies and records signal leakage.
- Transmits ingress signal into cable plant with GPS location.
- Combines leakage, GPS and ingress data to pinpoint source, location, and strength of egress/ingress.

Both of these HOT new standards will be ready to help maintain your system's integrity very soon!

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

In Canada: White Radio Limited
940 Gateway Drive • Burlington, Ontario L7L 5K7
1-800-263-0783

ComSonics, Inc.
We set the standards.

Cable-Tec Expo '98

All Technical, All the Time

By Laura K. Hamilton

If you didn't leave Denver last month with your head veritably bulging with cable know-how, well then, you're practically the impossible customer when it comes to technology at cable confabs. If the Society of Cable Telecommunications Engineers Cable-Tec Expo doesn't do it for you, nothing will.

This is the show cable engineers wait for every year, and for good reason. No matter what your particular hankering for technology is when you arrive, it's truly difficult to leave the show disappointed. Whether you wanted to soak in the latest technical expertise on the return path, digital, hybrid fiber/coax (HFC) architectures, network management, powering or cable modems, it was all there for the taking at Expo '98.

Preconference sessions

For those looking for the basics, the day before Expo was the perfect time to get background on high-speed data, cable modems and the components of digital.

During the "LAN/WAN Basics and the Transport of High Speed Data in CATV Networks" session, it was pointed out that with the advent of Internet access, ad insertion, Internet protocol (IP) telephony and other applications, computer networking principles and techniques are fast becoming an integral part of the cable network. Key concepts in internetworking for cable applications were introduced.

"Basics of Cable Modems and MCNS" was your opportunity to learn about the Data Over Cable Service Interface Specification (DOCSIS) and cable modem specifications specific to MSO networks. Topics discussed included the RF channel model and modulation types, the Moving Pictures Experts Group (MPEG-2) layer, the media access control (MAC) protocol and security schemes used to protect user data.

Finally, an introductory course on the components of digital was offered preconference. Attendees learned that digital multiplexing in the cable telecommunications industry is not only one technology. It is a set of multiplexing standards that can all coexist in a digital system. Overviews of the North American Digital hierarchy, synchronous optical network (SONET) and MPEG-2 were given, with comparisons and contrasts.

Workshops

At the very center of SCTE's Expo are its workshops. This year's seminars included the following:

- "Getting the Physical Plant Ready for Digital Services." This had attendees working hands-on with equipment and receiving instruction on interpreting results.
- "Digital Video Deployment." The constellation display was presented as a means to understanding the condition of a 64-QAM (quadrature amplitude modulation) signal and identifying impairments.

  Also discussed were issues that likely would be encountered when adding digital technology to an existing cable system. How can problems associated with a digital launch be minimized? This workshop offered answers.

  Finally, operational and technical training considerations required for deploying digital video were detailed.
- "Excellence Through Customer Service." Who really controls the image of your organization? How can you give quality service? How should you handle complaints? These questions as well as "The On-Time Guarantee" were discussed.
- "HFC Architectures." Dense wave division multiplexing (DWDM) and

It Wouldn't Be A Digital HFC Upgrade Without

THE Digital UpQRade Cable

QR from CommScope — as superior to traditional coax as the CD is to the 45 rpm record.

FACT! QR's connector interface not only lasts longer than any other cable - it also prevents return path ingress. **FACT!** By using QR, you could save up to 20% on the cost of your installed cabling system. **FACT!** So flexible, durable and crush resistant, low attenuation QR is the only coax backed by a 10 year warranty — the longest in the industry. **FACT!** More than 400,000 miles of QR already upgrades the world... and we're just getting started. **FACT!** Get the facts from CommScope's HFC Upgrade Manual. It's free for the asking. So call today. And get the digital UpQRade cable for your digital HFC network.

CommScope®

How Intelligence Travels.

For information call 1-800-982-1708 or 828-324-2200 www.commscope.com

Reader Service Number 35

scalable nodes as well as wave division multiplexing (WDM) technologies were detailed.

- "Network Management/Status Monitoring." According to discussions in this workshop, the requirements for improved network management can be summed up in one word—integration. That means integrating software systems with business processes to meet business objectives. The requirements of an integrated network management solution and the critical issues involved in planning, implementing and using network management tools were examined.

  Also detailed were cable operators' opportunities and the role of network management in HFC telephony.
- "Powering Issues." In order to provide telephony service through coaxial networks at the level of system reliability that can meet the expectations of wireline telephony customers, many operators have decided to power the premise equipment and premise phones. This workshop focused on the cost of safety provisions mandated by the proposed Article 830 of the 1999 National Electrical Code (NEC) for this type of power delivery system.
- At the "Regulatory Update" workshop, a review was offered of comments filed in the second Further Notice of Proposed Rulemaking concerning selective override of cable channels plus other Emergency Alert System (EAS) issues affecting cable.

"This is the show cable engineers wait for every year, and for good reason."

The sometimes sticky topic of digital and must-carry also was discussed including legal, political and regulatory implications.

- And what would be a technical conference be in today's two-way conscious environment without plenty of workshops about the return path? Expo offered three different return seminars explaining design, components and alignment; ingress mitigation; and return path testing.
- Finally, the SCTE's Interface Practices Subcommittee Test Procedures were presented. They included IPS-TP-206, Composite Triple Beat Distortion; IPS-TP-207, Composite Second Order Distortion; IPS-TP-208, Cross Modulation Distortion; and more.

Don't miss "Communications Technology's" comprehensive coverage of Cable-Tec Expo in next month's issue. Also, if you'd like to order the Expo '98 proceedings manual, contact SCTE at (610) 363-6888. CT

Laura Hamilton is senior editor at "Communications Technology" in Denver. She may be reached via e-mail at lhamilton@phillips.com.

divided between 18 and 60 homes. Therefore, the data rate per home will be 2.8 Mbps to 0.83 Mbps.

Too much is never enough

A network being built or rebuilt today should be able to support demands for at least the next 20 years. While 0.83 Mbps to 2.8 Mbps in the upstream direction might seem sufficient, several trends indicate that this might not be so.

The accompanying figure shows a plot of the baud rate (nearly equal to bps) for various telecommunications modem standards and the year those standards came into common use. The earliest standard was the Bell 100 series, which could achieve 300 baud. The maximum transmission rate increased slowly over the next 30 years.

In 1987, there was a revolution in computer modems that has increased the maximum baud rate by more than an order of magnitude in a decade. These standards have allowed individuals at home to connect to the Internet and have driven demand for bandwidth-intensive multimedia content.

The information in the figure allows two obvious extrapolations. We can assume that the increase in baud rate will return to the pre-1987 level, or we can assume that the rate observed since 1987 will continue. Both of these options are shown in the figure. These two scenarios represent a reasonable minimum and maximum. Based on this, we can predict that homes will be using up to 25 Mbps in the year 2020.

The growing demand for data transmission presents a great dilemma for system operators. Building a network that can support today's needs is less expensive than building one that can support the needs of 20 years into the future. However, it could be very expensive in the future to upgrade today's network to support the higher data rates that inevitably will be required.

Architectures for future demands

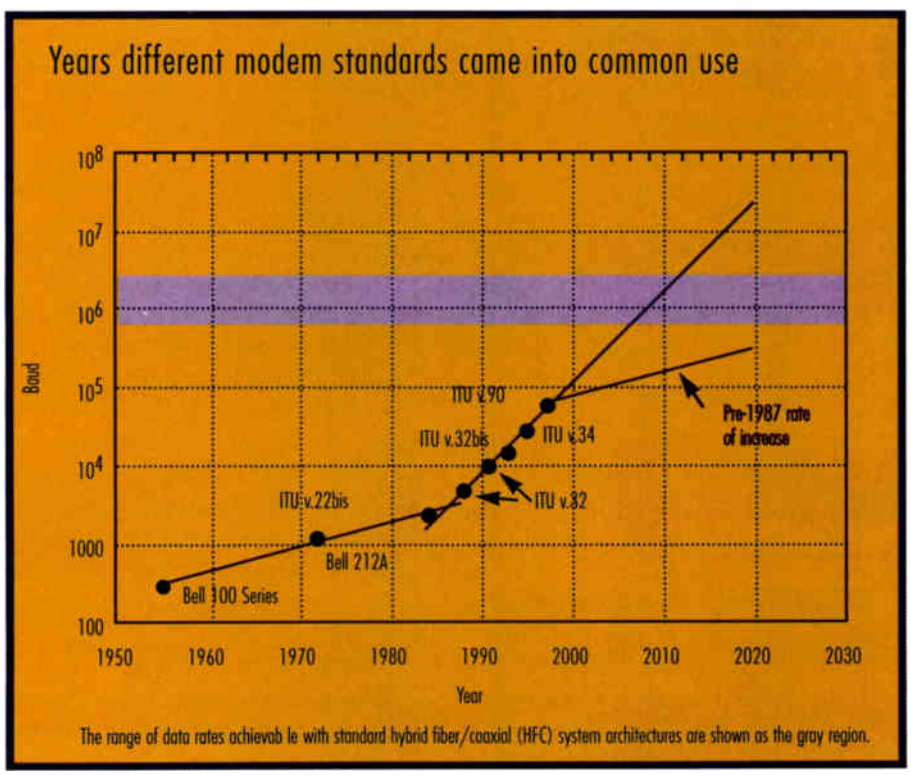
It is clear that cable TV networks must meet several criteria to be successful in the future:

- The network must be able to cost-effectively support bidirectional, point-to-point data transmission in the near future.
- Data rates should be symmetrical and should match or exceed those obtainable by other means.
- To meet subscribers' increasing demands for data transmission, it must be possible and cost-effective to increase the data rate per home in the future.

To support high data rates per home, a cable TV network must be highly segmented. As the optical node forms the basis for segmentation, it is critical that the node be capable of supporting the required data transmission rates to the homes to which it is connected.

Several network architectures meet these criteria. The simplest is to build a standard HFC network suitable for the transmission requirements of today. When more bandwidth per home is needed, an additional optical node can be added near the nodes, with half the homes from the first node moved to the second. This certainly is cost-effective today. However, it does require adding an entirely new node receiver and may require reconfiguring the RF plant in the future, which is very costly.

Another method is to use a scalable optical node, meaning that each port of the node can be addressed with unique information. Typical nodes support 500 homes passed per node with each node having up to four ports. A single fiber for each of the forward and return paths is used to bring video downstream at up to 50 Mbps in both downstream and upstream to all the subscribers connected to the node. If



The range of data rates achievable with standard hybrid fiber/coaxial (HFC) system architectures are shown as the gray region.

Top 5 Node-Related Questions Operators Should Ask Before a Network Upgrade

1) How many homes per node will need to be supported?
2) What are the bandwidth requirements of the directed services you wish to offer?
3) How should the nodes be configured to support short-term service goals?
4) How important is the capability to upgrade the nodes to support future services?
5) Will the nodes require redundant components to meet the reliability requirements of the network?

BOTTOM LINE

Build Data-Friendly Nodes

It is clear that high-speed Internet access, video-on-demand (VOD) and telephony will drive cable networks to support high-speed point-to-point data transmission. The most obvious and simplest way to support point-to-point data communications is to divide the network by optical nodes and have each node carry unique information to and from the homes connected to that node.

Initially, the majority of users probably will require high data rates only in the downstream direction. However, several potential applications will have subscribers demanding symmetrical data transmission. In addition, the demand for data transmission will continue to increase with time, requiring networks that can support increasing data rates. While several network architectures can support increasing data communications rates, an architecture based on a scalable node allows upgrading the network most easily.

20% of the homes passed subscribe and 30% of these are using the network for data transmission simultaneously, this node can provide 1.7 Mbps per user.

In the future, when a higher data rate per home is required, optical receivers and/or return transmitters can be added to the node. These optics scale (subdivide) the node—access some portion of the RF system connected to the node. This is an efficient way to subdivide the node without doing a major rebuild. If each of the four ports can support unique information, the data rate per can be multiplied by four by scaling the node. Furthermore, scaling the node requires only adding modules, which costs much less than adding a second node.

Eric Schweitzer, Ph.D., is receiver systems product manager for Harmonic Lightwaves. He can be emailed at eric.schweitzer@harmonic-lightwaves.com.

MOORE

Fiber Optics/Power Supply And Network Distribution Enclosure

Cross Connect Cabinet

This engineered enclosure is specifically designed by Moore to house fiber optic cable, standby power supply equipment and the electronics found on digital loop architectures used to support the delivery of voice, data, video and information services.

Internal support and storage components can be custom selected based on the specific electronics and powering designs. Overall dimensions vary depending on system requirements.

Call today to learn how Moore solutions can benefit your business.

1441 Sunshine Lane • Lexington, KY • 40505-2918 • Phone: 800-769-1441
Fax: 606-299-6653 • Internet: http://www.mooredp.com

Reader Service Number 40

Optimize Nodes for Nontraditional Services

Prime Considerations for the Planning Phase

By Nick Burmylo

In today's competitive cable TV industry, operators are under increasing pressure to offer additional services. Standard revenue-generating services traditionally offered over cable TV now can be found on several satellite networks. Overbuilds and other locally based competition are adding even more pressure.

In the past, operators increased bandwidth for more downstream channel capacity to allow the addition of new pay services, such as HBO and Cinemax, and pay-per-view services, enabling operators to expand their standard and tiered basic services. These services added revenue without requiring major architecture redesigns.

But today, operators must move toward less-traditional products and services to remain competitive. More operators are starting to offer new interactive services, which require allocating bandwidth in the return path and redesigning network architectures. The subsplit band plan used in most systems means the reverse spectrum will be limited (for example, 5 MHz to 40 MHz vs. the forward bandwidth of 50 MHz to 750 MHz). As these services are implemented, the number of homes passed by the optical node must shrink and the node be driven closer to the subscriber in order to achieve a serviceable upstream data pipeline.

Service selection

Deciding which services to offer and developing an implementation timeline at the beginning of an architecture redesign can lower the cost of ownership over the system's life. It also can help operators estimate the additional costs associated with an upgrade before fully committing to design implementation.

Two important factors to consider are the subscriber base and the desired market effect. Market-polling can help determine if a service you plan to offer will sell in your market. Learning that a service is unnecessary is as important as determining which services are desired, since the money marked for that service can then be used for the remainder of the planned upgrade.

Understanding the life expectancy of your system is a good gauge in deciding which services to include. Factors such as cable age and availability of equipment and technology may change a plant's life expectancy. If your plant will need another upgrade in the coming years, design for only those services that can be turned on today, and shy away from those that "will soon be available."

Impact realization

Once deciding upon the service selection, research its impact on your upgrade budget. Each optical node placed can cost between $8,000 and $15,000 for equipment in the field and at the headend, not including fiber-optic cables and installation.

Cost vs. benefits

Developing the proper guidelines for node sizes can be a complicated process, since there are no charts offering the proper size for a given service. However, some calculations can be made to derive a service-area estimate.

First determine your most bandwidth-hungry service. For this discussion, we will choose a cable modem. Next, determine how much of your return bandwidth can be allocated for this application. For

BOTTOM LINE

Nontraditional Services

Today, competition is fierce, and operators are under increasing pressure to offer additional services. Standard revenue-generating services traditionally offered over cable TV can now be found on various satellite networks. Overbuilds and other locally based competition are adding even more pressure.

To compete, operators must move toward less-traditional products and services. More operators are starting to offer the new interactive services, which require allocating bandwidth in the return path and redesigning network architectures. To accommodate the strenuous upstream activities in these networks, the reverse signal-stream service area must be limited; and as more services become available, optical nodes should be driven farther and farther into the plant. This article provides guidelines for designing the optical broadband network node size while balancing service and cost requirements.

BIG NEWS FOR BIG SYSTEMS

EAS UPDATE
FCC'S SECOND REPORT AND ORDER RELEASED.
December 31, 1998

If your cable system serves 10,000 or more subscribers, the time has come to act on EAS compliance—Trilithic makes it easy.

Trilithic's modular EASy™ system offers you an EAS solution that can be quickly and seamlessly integrated into literally any headend architecture, no matter how complex or sophisticated. With the EASy system you save time and money with bolt-on simplicity and the security and convenience of single source manufacturing and support. And with EASy, EAS compliance is as easy as mixing and matching the specific capabilities you need:

- IF substitution
- Crawls and all-channel messaging
- Video substitution
- Control of remote hubsites

EASy™ SYSTEM
EAS Compliance Technology

Call now at ***1-800-344-2412*** *for Trilithic's free EAS compliance videotape.*

Visit Trilithic's web site for a full download of the FCC's Second Report and Order: ***www.trilithic.com***

Don't wait, call Trilithic today for the good news on EAS. Not only will you receive our free videotape on EAS compliance, you'll also receive a free system quote and free EASy product descriptions and specifications. Call 1-800-344-2412.

YOU CAN'T BEAT THE SYSTEM

TRILITHIC
The Best Thing On Cable.

317-895-3600 FAX 317-895-3613

Reader Service Number 41

NEW and REFURBISHED
MODULATORS

TULSAT TULSAT TULSAT TULSAT TULSAT TULSAT TULSAT

GENERAL INSTRUMENT

C6M & C6MII
C6MII Agile 1 gz
C6M Agile 600 mhz
S890D Demodulator

SCIENTIFIC ATLANTA

SPECIAL $449
Fixed Ch. Hyper AA-LL
60db PLL 41.25 audio

SCIENTIFIC ATLANTA

NOW
Over 2000 in Stock
6340 6330 6350 9260

R. L. DRAKE

Agile 450 mhz 60 db
Agile 550 mhz 60 db
Stereo Agile 60 db

REFURBISHED AGILE

BT 300mhz 60db
$225
DX 450mhz
$275

SCIENTIFIC ATLANTA

6350
Chan 2 thru 78
& Sub Band
Stereo & SAP

BLONDER TONGUE

NEW 60 db Output
Chan 2 thru 36 $399
Chan 37 thru 62 $429
Sub Band & A-1 thru A-5

BLONDER TONGUE

CAM-60S w/Stereo
Chan 2 thru 36 $799
Chan 37 thru 62 $849
Sub Band & A-1 thru A-5

BLONDER TONGUE

Economy 60db
Chan 2 thru 22 $119
Chan 23 thru 36 $139
A-1 and A-2

STEREO-SAP

Scientific Atlanta Blonder Tongue Standard Leaming R.L. Drake

1605 E. Iola
Broken Arrow, Ok 74012

800-331-5997

We Repair Modulators

TULSAT TULSAT TULSAT TULSAT TULSAT TULSAT TULSAT

Reader Service Number 42

HEA

- **Cable**—Specialized head all RF applications.
- **Connectors**—Premium ed. They must be insta instructions, and properly mum of 20 inch-pounds, the headend equipment r
- **Adapters**—Where possi series adapters such as BI

Conn careful

FM tu pass-ty

Comm ly to th choke c turn, 5

High pa ence rejr

Conve er at th

DRO

- **Overhead drops**—Use sengered cable supporte in the shield at the end c
- **Underground drops**— Non-flooded cable may b
- **Cable type**—All drop c
- **Shielding**—In most cas be necessary for two-wa
- **Bend radius**—Sharp b shield damage.

TROUBLESHOOT
PULL-OUT WAL

-)END

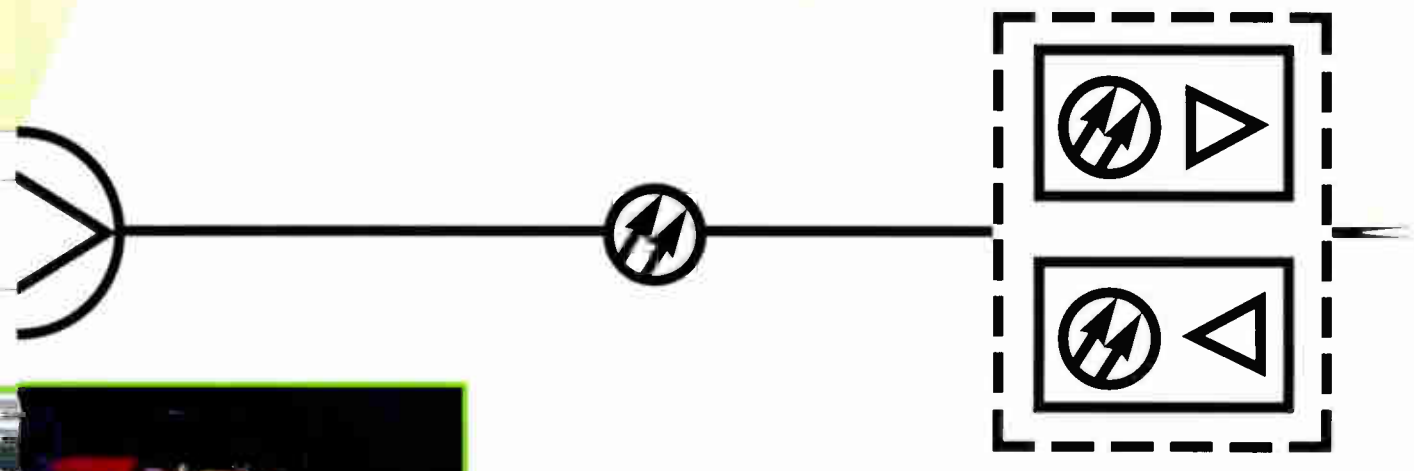
end cable should be used for

connectors are recommend-
illed per the manufacturer's
tightened (generally a mini-
unless otherwise specified by
anufacturer).

ole, avoid the use of between-
JC-to-F.

PASSIVI

- **Faceplate**—Torqued to manu
- **5/8-24 port plugs**—Must be and tightened.
- **Hardline connectors**—Prop and weatherproofed.
- **Housing-to-housing connec** tightened and weatherproofed tape or Coax Seal).
- **Support brackets**—Support integral support bracket or an srtess on the cable and/or conr



TV/VCR/FM TUNER

ctors—Make sure connectors are properly installed and y tightened.

ers—Use an FM splitter to feed the tuner, or an FM band- e matching transformer at the tuner's input.

n mode choke—For consumer devices connected direct- cable, try a common mode choke at each device's input. A an be made by coiling 10 feet of drop cable into a seven -6" inch diameter loop.

ss filter—If a choke does not provide sufficient interfer- ction, install a high pass filter directly at the device's input.

ter—For severe TV/VCR ingress problems install a convert- device's input.

P CABLE

only messengered cable. Non-mes- l by grips will develop radial cracks f the grip.

Only flooded cable should be used. e damaged by water or alkaline soil.

able must be bonded foil type.

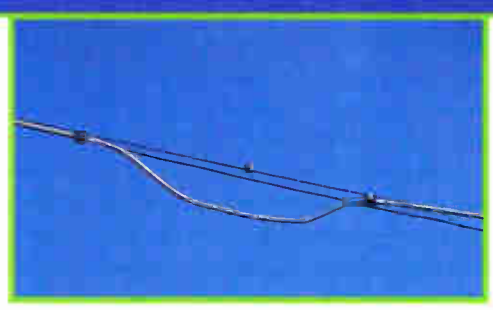
es tri-shield or greater shielding will services.

nds in the cable may cause hidden

F CONNECTORS

- **General**—Loose or improperly installed F connectors are among the most common causes of drop-related ingress.
- **Quality**—Cheap connectors may suffer from poor RF shielding, and improper annealing (the connector may crack when crimped).
- **Connector installation**—Correct cable preparation; right connector for the cable in use; connector properly installed; and tightened to at least 20 inch-pounds (except at the TV or VCR).
- **Weatherproofing**—All outdoor connectors must be properly weatherproofed, even those in lockboxes or pedestals.

TING INGRESS
L CHART



S

acturer's specifications.
installed in unused ports

erly installed, tightened,

tors—Properly installed,
(use self-amalgamating

passive devices with the
external bracket, to limit
ectors.

CABLE

- **Sag**—Span sag should be 1.5% to 2% assuming available clearance. Insufficient sag may cause radial cracks in the bottom of expansion loops at poles.
- **Expansion loops**—Must be mechanically formed; hand-formed loops are likely to cause cable damage.
- **Lashing wire**—Broken lashing wire will allow cable to hang loose from the strand, potentially causing kinks and/or cracks.
- **Kinks**—Kinks in loops, corners, at the back of connectors, and in confined spaces such as pedestals and vaults may turn into cracks.
- **Cable protection**—Protect cables from rubbing or abrasion at or near poles, crossovers, or through trees.

- **Lid closure**—To check for warpec ing.
- **5/8-24 port plu** ened.
- **Hardline conne** erproofed.
- **Housing-to-ho** and weatherproc
- **Support brack** with the integral limit stress on th
- **Test points**—If ity poles, protect accidental dama ened and weath lead when not in

DROP COMPONENTS

- **RF shielding**—Splitters should have a crimped, soldered or press-fit cover, not glued on. Terminate all unused splitter ports, making sure that the terminators are tightened to at least 20 inch-pounds. Use F port thread sealing sleeves for weatherproofing.
- **Connectors**—Make sure connectors are properly installed and tightened (minimum 20 inch-pounds), and weatherproofed if outdoors.
- **Cable attachment**—Check for staples. They can cause shielding damage.
- **Ground block**—Lack of connector weatherproofing may cause corrosion damage and ingress.
- **Unauthorized installations, customer-installed components or outlets**—These are a major source of ingress. Look for twinlead; consumer-grade cable and components; improperly installed connectors; low-isolation A/B switches; and the drop inadvertently connected to a rooftop antenna.

CONNECTION AT TAP

- **Connectors**—Correct cable preparation; right cc for the cable in use; connector properly installed ar ened to at least 20 inch-pounds; weatherproof the tor and tap port threads.
- **Locking terminators**—If locking terminators r used on spare tap ports, use models without a built tor. Some locking terminators with resistors ma ingress if they are not tightened or weatherproofed

ACTIVES

rqued to manufacturer's specification. Be sure to housing covers caused by improper bolt tighten-

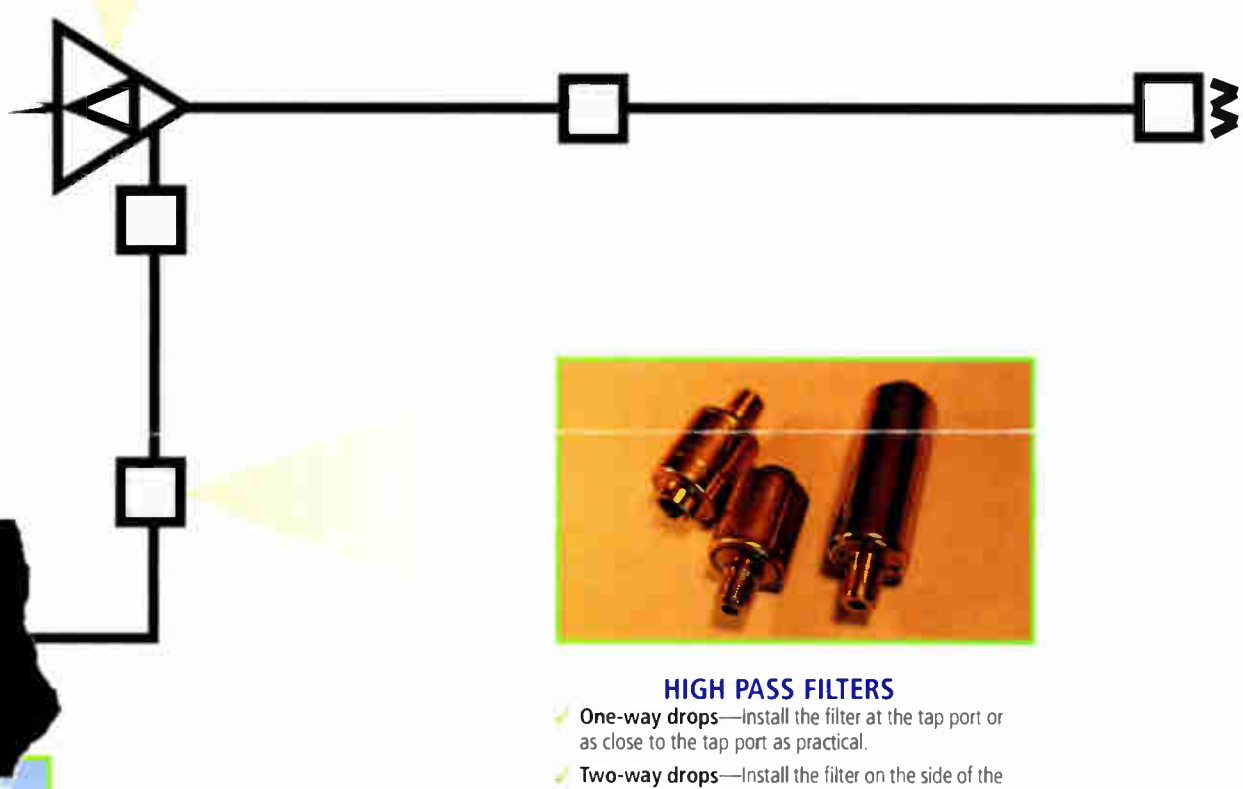
gs—Must be installed in unused ports and tight-

ctors—Properly installed, tightened, and weath-

ısing connectors—Properly installed, tightened fed (use self-amalgamating tape or Coax Seal).

ts—Active devices must be properly supported support bracket(s) or an external bracket(s), to cable and/or connectors.

emote test points are installed at the base of util- lrop cable with U-shaped cable guards to prevent ıe. Connectors must be properly installed, tight- erproofed. Terminate the lower end of the test use.



HIGH PASS FILTERS

- **One-way drops**—Install the filter at the tap port or as close to the tap port as practical.
- **Two-way drops**—Install the filter on the side of the home at the splitter output that feeds one-way devices (TV, VCR, etc.). Leave the port to the two-way device (e.g. cable modem) unfiltered.

Reference Chart

MAIN LINE A LEADER IN THE DISTRIBUTION OF NEW AND REFURBISHED EUIPMENT FOR TEN YEARS, IS NOW MANUFACTURING A COMPLETE LINE OF:

REPLACEMENT PADS,EQUALIZERS AND PLUGINS FOR:

SCIENTIFIC ATLANTA,TEXSCAN
GENERAL INSTRUMENTS/JERROLD
PHILIPS /MAGNAVOX

FORWARD-REVERSE-THERMAL COMPENSATORS
VARIABLE REVERSE-DIRECTIONAL COUPLERS

FORWARD, REVERSE AND CABLE SIMULATORS


YELLOW AND BLUE PADS


TEXSCAN AND PATHMAKER PADS AND EQ.'S


INTERSTAGE'S THERMAL'S COMPENSATOR'S


SPLITTERS JUMPERS D.C'S

- o ALL M.L.E.'S P.C. BOARDS ARE PRODUCED TO MIL-SPEC STANDARDS IN ACCORDANCE WITH OUR STRICT ELECTRICAL TOLERANCES.
- o ALL P.C. BOARDS ARE SOLDER MASKED TO INSURE BOARD PROTECTION, LONGEVITY AND RELIABILITY.
- o MLE USES THE NEWEST SURFACE MOUNTED DEVICES (SMD) AND ASSOCIATED TECNOLOGY IN MOST OF OUR DESIGNS,INSURING THAT WE BUILD THE MOST RELIABLE PRODUCTS POSSIBLE THAT MEET OR EXCEED ORIGINAL FACTORY SPECIFICATIONS.
- o ALL OF OUR PINS ARE GOLD PLATED TO INSURE THE BEST INTERCONNECTION POSSIBLE.
- o OUR CUSTOM DESIGNED TEST SYSTEMS AND 100% TEST AND Q.A. SYSTEMS INSURES THAT YOU WILL RECEIVE THE BEST PRODUCT AVAILABLE IN THE MARKETPLACE TODAY.
- o ALL OUR PRODUCTS ARE BUILT IN OUR FACILITY IN CARSON, CA.. THIS ALLOWS US COMPLETE CONTROL OVER ALL OUR MANUFACTURING PROCESSES AND INSURES YOU OF THE HIGHEST QUALITY PRODUCTS.


52E SERIES


G.I. FORWARD EQUALIZERS


G.I. REVERSE EQUALIZERS


52E-300 AND 550 EQUALIZERS


9A/JXP/JXP PADS CUSTOM VALUES AVAILABLE

REMEMEBER M.L.E FOR ALL YOUR NEW AND REFURBISHED LINE GEAR, PASSIVES FIBEROPTICS AND CONVERTERS.

Data-Friendly Node Design

Use Scalable Nodes for Increasing Data Rates

By Eric Schweitzer

High-speed Internet access, video-on-demand (VOD) and telephony are just a few of the advanced directed services that subscribers increasingly seek from their cable operators. Eager to satisfy this growing demand, operators have ambitious plans to upgrade their existing networks—or build new ones—to support the delivery of these services.

A typical modern cable TV network employs a hybrid fiber/coaxial (HFC) architecture, in which there is a direct connection from a central location to each optical node ceiver and a coaxial tree-and-branch following the node. Therefore, the node forms a convenient point to segment the network. Because of this, the node becomes a key component of a cable TV network used for data communications. Indeed, the maximum data rate per home that can be achieved by a network is determined by the data rate to the nodes and the number of homes connected to each node.

Currently, most individuals using the Internet are information consumers; therefore, data rates are needed in only the downstream direction initially. However, several applications, such as Internet telephony and video telephone, have individuals providing data at the same rate as they consume it. Because of this, cable TV networks must be two-way and support equal bandwidth in the downstream and upstream directions.

Bandwidth per home

All of these advanced services require point-to-point data communications within the cable plant. Cable TV networks were designed to supply broadcast video in a very cost-effective manner. Designing a cable network that can effectively support data communications services poses a quandary for system operators. To further the dilemma, cable TV networks historically have been very cost-effective; future network architectures must continue to be so.

By definition, a broadcast system delivers the same information to everyone on the system. Therefore, the information transmission capacity is limited by the frequency bandwidth. In contrast, a network that supports point-to-point communications must allocate a communications path to each point. The information transmission capacity of a point-to-point communications network is, therefore, defined by the bandwidth available per point.

In a cable TV network, a point is a home, and the significant parameters are bandwidth per home passed and bandwidth per subscriber.

The most significant parameter in defining an upgrade is the amount of bandwidth to be allocated per point. In today's HFC architecture, it is easy to supply dedicated bandwidth to each optical node receiver. This is accomplished by having an optical transmitter dedicated to each node. Common builds today support 300 to 1,000 homes passed on an optical node.

Most modern cable TV systems in the United States have a return band that extends from 5 MHz to 40 MHz and a forward band that extends from 52 MHz to 750 MHz. Eighty analog channels are transmitted in the forward band between 53 MHz and 550 MHz. The remaining 200 MHz can be used for digital channels and/or point-to-point data transmission. As there are 35 MHz available in the return band and 200 MHz in the forward, it is anticipated that bandwidth in the return path will be more limiting. Most system noise also appears in the low frequency end of the spectrum, making the useable return band even smaller.

Let us assume that 30 MHz are available in the return band. This can support five 6 MHz data channels. Each 6 MHz data channel can easily support a 10BaseT Ethernet connection of 10 Mbps. Therefore, the five channels can support a total of 50 Mbps.

This bandwidth is divided between the 300 to 1,000 homes connected to the optical node. However, not all homes passed will subscribe to the service. Even among subscribers, it is highly unlikely that all will be accessing the network at the same instant. If we assume a 20% subscription rate and that the network needs to support 30% of the users at any given instant, the available bandwidth will be

LITTLE GUY TO WATCH EXPLODING, NUDITY, AND EVERY OTHER SENTENCE?

PARENTS SURE WON'T. AND THAT'S WHY THEY'LL WANT V-GIS.

V-gis by Tri-Vision is the V-chip technology you might have heard about in the news. It's a small box with a remote control that's the most advanced parental TV monitoring device ever.

Only V-gis allows parents to block out programs by TV codes, movie codes, or specific content like violence, sexual situations, language and dialogue. Only V-gis is built to be upgraded as technology changes. Best of all, V-gis works on any TV and is easy to use. Set it once, and it's on guard 24 hours a day on any channel.

Up until now, parents haven't always been able to monitor everything their kids see on TV. But with V-gis, they can. V-gis is destined to be one of the most sought-after TV products in years. Don't be left out. Place your order today and you just might wind up using an "F" word yourself: "Fabulous!"

V-gis, by Tri-Vision. **1-88-TeleWire**

V•gis™ BY TRI-VISION

TRI•VISION

THEY'RE ONLY KIDS ONCE

AVAILABLE EXCLUSIVELY FROM TeleWire SUPPLY AN ANTEC COMPANY

Reader Service Number 47

Deployment options for digital scrambling

Option	Probable result
Ignore digital, stay analog.	Be driven out of business.
Co-carry both analog and digital scrambled services along with analog unscrambled basic.	Inventory proliferation; pirates still steal analog services; wasted spectrum; reduced incentive for customer to move to digital tier.
Keep unscrambled analog basic only; carry all scrambled services on digital system.	No descrambling analog converters required; all pirating stopped or deferred; improved pictures with digital encourage customer to move to digital tier.

security packets are contained in-band.

Note that the in-band signals carried with each MPEG transport stream apply only to the channel on which they are carried, and each MPEG TV channel has its own peculiar security packets. On an out-of-band control channel, all the keying and authorization data applying to all digital channels are carried on the single carrier. Each approach has pros and cons.

The in-band system requires a packet inserter in the headend for each encrypted digital channel. While this seems like an unsupportable complication, each encrypted digital channel also has a digital encryption device at the headend. Adding the ability to insert packets at that point represents an extremely small increase in complexity. For programming sources such as Headend in the Sky (HITS) where re-encoding at the headend may not be necessary, the insertion of ECMs and EMMs can be accomplished at the uplink facility, and no additional complexity is required at the headend.

The out-of-band carrier represents a system vulnerability; if the signal is jammed or otherwise fails, the entire system, including every encrypted channel, also fails at the next key change. With the in-band system, the failure to rekey affects only the single channel where the problem occurs. There also is some question as to whether cryptographic synchronization can be supported during rapid key change intervals with the single out-of-band carrier.

All of this relates back to a basic security consideration for multichannel digital TV on cable. If you have a properly functioning decoder, two key elements still are required to decrypt a program: the cryptographic key and the authorization code. Suppose a security and access control system uses the same cryptographic algorithm and electronic key to secure every differentiated channel on the system. This means that the correct key is present in the home terminal equipment to decode every program on the system. The only feature preventing that from happening is the authorization code, which sets the personality of the decoding unit.

This therefore negates much of the advantage of digital security by making it work just like existing analog descrambling converters. Turn them on, and they decrypt; turn them off, and they don't. The biggest advantage is found in using

example, if you are implementing the modem into a newly equipped return path, you will have 35 MHz (5 MHz to 40 MHz) of available bandwidth. Since some inherent problems are encountered at the low end of the spectrum, we will choose to place 20 MHz of cable modem activity into the network's return band. We then must determine how many simultaneous communication activities this application can accommodate.

To do so, find the total bits per second capacity of the service area based on the allocations expressed for this one service. Multiply its bandwidth efficiency (bps/Hz) by the total available bandwidth (BW), assuming that this service is running at 100% efficiency.

Capacity = (bps/Hz) x (BW)

For the cable modem, the bandwidth efficiency is 2 bps/Hz; the serviceable bandwidth for this application is 20 MHz. (2 bps/Hz x 100% efficiency = 2 bps/Hz)

Capacity = 2.0 x (20 x 10^6); Capacity = 40,000,000 (40 x 10^6) bps

Next, determine bps per user information to find the number of users able to access the system simultaneously. Assume that we will allot 500 kbps/user for our cable modem.

Simultaneous users = Capacity/(bps/user)

Simultaneous users = 40,000,000 bps/500,000 bps per user; 80 simultaneous users per node

With a little more information and further calculation, we can determine the node's homes-passed capability (homes per node, or HPN).

HPN = Simultaneous users / (penetration rate) x (take-rate for this service) x (utilization factor)

If we know that our penetration rate is 75% and that 25% of our paying customers will purchase this service, we can estimate the maximum number of customers that will be connected simultaneously at 80 percent and calculate our maximum node service area.

HPN = 80 / (75%) x (25%) x (80%); HPN = 533 HPN

These numbers all are loosely configured for demonstration purposes. You will not accomplish 100% efficiency for any service, and all systems will need their own bandwidth allocations.

After calculating the available node size for this service, the next step is to assess the cost of building this service into the network. Assuming we are designing a system for 50,000 homes, we can calculate the impact of node segmentation.

If our design averages 90% coverage ratio per node because of lay-of-the-land issues, we can calculate an average of 480 homes served per optical node.

50,000 HP / 480 HPN = 105 nodes (104.2)

Assuming a cost of $10,000 per optical node for equipment, the total cost (again, excluding fiber-optic cables and installation) of node segmentation becomes $1,050,000. You can determine

this service's impact by analyzing what the cost of an upgrade for performance-driven cascade reduction without strenuous attention to the return path would be.

In this cost structure, you can study how this alternate-service-supplying architecture will impact implementation. Gather your construction and system design experts to review costs of additional cable in the system. Ask questions such as:

- How much feeder plant redesign is needed?
- Is further segmentation, or sub-noding, appropriate for the future of this plant?
- How will this redesign impact the services offered today during the construction?
- How much down-time is being built into the upgrade process by reducing the node size?

Remember that most tree-and-branch architectures in moderate- to high-density areas may have more than your allowable HPN fed from one existing trunk amplifier. This redesign may cause considerable downtime and necessitate contingency plans to feed legs of the amplifiers removed for this redesign.

Once armed with the upgrade's cost architecture, you can decide how and where to use the upgrade budget. This information also can help you determine what pricing structure you need to charge to meet the system's capital-return objectives.

Preparation

System-design preparation is the next step. A strict HPN guideline enables quick and accurate node-spotting and facilitates the ordering of optical products and fiber far in advance of other design methods. The actual node segmentation can be done on computer aided design (CAD) base/strand maps with the assistance of house-counting list processing (LISP) programs and/or manual data calculations. Once the nodal footprints are set, the design phase is ready to begin.

Implementation

It is extremely important to assess and reassess the node-size specification during the earliest design processes. Now is the time to make changes to the scheme if your design is becoming too cumbersome or is omitting some important details.

Options include adding sub-nodes or characterizing the nodes as sub-nodes themselves. Always review the impact these choices may have on the upgrade costs and implementation.

More design projects run over-time and over-budget because of poor planning than any other aspect of the design process. CT

Raskin, Donald & Stoneback, Dean. *Broadband Return Systems for Cable TV* Ed. Dit Mosco. Upper Saddle River, NJ: Prentice Hall, 1998. 118-120.

Nick Burmylo is system design senior project specialist for General Instrument. He can be e-mailed at nburmylo@gi.com.

Security And Access Control For Digital Cable TV

One Size Does Not Fit All

By Claude T. Baggett

Digital TV is interesting in more ways than one. Not only does it promise such benefits as more efficient bandwidth usage and high picture quality, it also allows a variety of robust security systems, all superior to those possible with analog signals.

Several design trade-offs should be considered by a system operator selecting a security and access control subsystem for protecting digital TV signals on cable TV systems. Several factors strongly affect the strength, adaptability and cost of such systems. The principles apply whether the primary source of security and access control in the subscriber home is found in a set-top decoder, a decoder interface unit, a home server, or an insertion in a Moving Pictures Experts Group (MPEG)-capable computer or TV receiver.

A "one size fits all" approach to the functionality and features of the security and access control system is not appropriate because of variations in cable system size, services, operating philosophy and access to capital.

In analog TV, basically only one decision can be made for access control—that is, whether to descramble the incoming signal. The same descrambler in the set-top converter is used whether the system has one scrambled channel or many. The sophistication and depth of the scrambling mechanism is limited because the analog signal is difficult to reconstruct without leaving unacceptable artifacts in the visible picture.

Therefore, with only one very limited process to protect the analog TV signal, meaningful security is difficult. Some later systems, which use line shuffling under the control of a modern cryptographic system and hard-encrypted audio, are superior, but are costly and have come too late relative to the advent of digital TV.

To protect digital signals, four basic mechanisms are utilized. First, a cryptographic algorithm is defined for the headend that will take the digital signal and scramble the binary characters so thoroughly that no practical amount of analysis will regain the original signal. This same mechanism is used to reconstruct the signal in subscribers' homes. If this were all that were possible with digital scrambling, it still would be of great benefit because of the depth of signal obfuscation and because it can be restored to its original condition without degradation. However, digital security is more versatile than that.

The second mechanism is the electronic key—literally a long binary word—that controls the scrambling and descrambling processes in the cryptographic unit. The cryptographic algorithm itself is useless without the electronic key. Furthermore, unlike analog scrambling, a different electronic key can be used for differentiated services. Multiple keys can protect a tier of services, a single digital channel, or a specific string of digital data such as a control channel, a pay-per-view (PPV) event or a multimedia display.

Keys can be symmetric, meaning that the same binary word is used to scramble and descramble the digital data; or they can be asymmetric, meaning that the key used to descramble the signal differs from the one used to scramble it. Keys must be generated, managed, protected, transmitted and utilized, thus forming the key management and distribution system that is the most critical part of the security process.

The third part of this system is the entitlement/authorization message or matrix. Originally, this was just a matrix of two columns by the number of rows equal to the number of occupied channels on the cable system. If a given channel had a binary one in the second column it was authorized for descrambling, and if a zero was placed there the customer was not authorized to receive it. This matrix was encrypted for transmission and stored in the secure microprocessor in the access control system. Now, a cryptographic system somewhat like the master key systems used in buildings can be devised to convert the simple authorization matrix into a cryptographic process, making it more difficult to defeat.

The fourth part of the system is a secure signature mechanism. Secure signatures make it possible to guarantee the identity of the sender of the digital message and to verify that the message has not been modified en route. This is especially useful in key distribution, certain control messages and in purchasing.

The specification of these four

mechanisms involves the consideration of the intended application, technology issues, threats and countermeasures, governmental policy and regulation, costs, and desired additional features.

Design considerations and trade-offs

For many years, the approved civilian cryptographic process in the United States has been the Digital Encryption Standard (DES). DES has several operational modes, so as to be as widely applicable as possible. The National Institute of Standards and Technology, the government agency responsible for civilian cryptography, has approved DES for use through approximately 2003, but plans to have a new encryption standard in operation by that time. This does not mean that the DES equipment in the field suddenly will cease to function or become more vulnerable, just that NIST will no longer support it.

DES is only one of many hundreds of electronic encryption algorithms, each with its target application, strengths and weaknesses. Many are appropriate for encrypting digital TV signals, so a choice of these on merit would be difficult. The North American cable industry has decided to begin its digital TV transmissions using the GI DigiCipher 2(r) system, which is DES-based. This does not preclude an operator from deciding on another algorithm, or starting with DigiCipher at the outset and changing to another algorithm later.

The importance of being able to choose from multiple algorithms is the ability to select or change systems without undue cost or operational impact. An operator may decide to change cryptology for several reasons, including:

- The security has been compromised, and pirating has begun.
- Unit reliability has deteriorated to unacceptable levels.
- The operator wishes to add new services that the existing suite of security equipment cannot protect.

Removable vs. built-in

In the past, analog descrambling converters always had security-related circuitry as an integrated part of the unit. Removable and replaceable descrambling circuitry was never important in analog TV because that circuitry represented an important portion of the overall cost of the box, and a pluggable interface to the descrambler is not cheap or easy. With digital decoders, the security represents a relatively small portion of the cost of the unit, and the interface for digital data is a well-known and practiced science.

Three basic approaches to the architecture of the security system exist as far as its placement is concerned. In case one, the security circuitry can be integrated into the circuitry in the MPEG-2 decoder. Case two has the security functionality placed in a removable module, such as a PCMCIA card, with an open architecture interface to the host device. Case three is a hybrid of the first two, wherein the security subsystem is built into the decoder, but an open architecture interface lets the internal system be replaced by a pluggable, replaceable one.

The fully integrated decoder with no external socket for replaceable security probably represents the path of least initial cost to the operating system. However, if and when the security requires replacement, the entire decoder must be replaced, representing hundreds of dollars rather than tens of dollars for a removable security module.

The other problem with this approach is that it is not responsive to the Telecommunications Act of 1996. This law states that set-top decoder units must be available at retail to the subscriber, but not the security element used by the cable system. This law necessitates making the security circuitry removable if the cable operator is not to lose control of security. If the security circuitry is not removable, then the consumer electronics manufacturer will decide which security is adequate to protect the cable business, and only one algorithm will be available.

The removable security element is responsive to the Act and provides the cable operator a cost-effective way to replace the functionality when the need occurs. The proposed PCMCIA module has adequate capability to provide all of the needed functionality and additional features demanded by the marketplace and has an interface that is more than adequate for the needed control and data transfer.

Three separate efforts are underway to standardize the interface between the removable module and the host device. These are the Digital Video Broadcasting (DVB) Common Interface Specification being planned for Europe, which uses a pin-depleted version of the PCMCIA card; the National Renewable Security Standard (NRSS) of the United States, which

BOTTOM LINE

Keep Digital Signals Secure

Several design trade-offs come into play when selecting a security and access control subsystem for digital TV signals over cable.

Some have minor impact on security quality, but others have a pronounced effect on robustness, integrity, usefulness, cost and extendibility. A "one size fits all" approach is not appropriate because of variations in cable system size, services, operating philosophy and access to capital.

Protecting digital signals requires four basic mechanisms. First, a cryptographic algorithm is defined for the headend to scramble the binary characters so that no practical amount of analysis will regain the original signal. This same mechanism reconstructs the signal.

The second mechanism is the electronic key, which controls the scrambling and descrambling processes in the cryptographic unit. The algorithm is useless without the key.

The third part is the entitlement/authorization message or matrix. A cryptographic system can convert the matrix into a cryptographic process, making it more difficult to defeat.

Fourth is a secure signature mechanism. Secure signatures make it possible to guarantee the identity of the sender of the digital message and to verify that the message has not been modified en route.

includes specifications for both the PCMCIA module and the ISO-7816 chip card; and the security working groups within the Society of Cable Telecommunications Engineers Digital Video and High-Speed Data Subcommittees of the SCTE Engineering Committee.

To define an interface between the security module and the host system, three separate issues must be resolved. First, the physical form factor of the module must be specified, along with the number and placement of the connector contacts or pins that provide the physical interface between the two entities. Second, the electrical specifications regarding powering, grounding, logic levels and clock speeds must be set. Finally, the format of the data, and the command set that controls the interface and integrates operations, must be determined.

> "The biggest advantage is found in using different cryptographic keys for each differentiated service or tier of channels."

The NRSS specification stops at this point and makes no attempt to define the exact security functionality contained within the removable module, leaving this determination to the marketplace. The DVB specification attempts to go further and define the exact security algorithm and feature set to be used by the operator. If DVB were accepted worldwide, it would mean that every cable system, broadcaster, satellite deliverer and multichannel multipoint distribution service (MMDS) operator would have the same cryptographic function for security, but that each would use an electronic key unique to its system.

The best advice from cryptoanalysts in the United States and elsewhere is that this is a foolish undertaking that would dramatically increase the worldwide vulnerability to pirating. However, there appears to be no strong reason why the interface specification between the NRSS and DVB standards cannot be harmonized, and efforts are underway in the NRSS subcommittee to do just that.

The specifications generated by the SCTE subcommittees will no doubt reflect some of the work on NRSS and DVB, further tailoring the requirements to cable industry needs. However, the DVB and NRSS work specifically targets the interface of MPEG-2 signals and may not be optimized for other data transmissions used on cable systems.

Therefore, efforts are beginning in the Security working group of the High-Speed Data Subcommittee of the SCTE to define a new interface, perhaps somewhat like NRSS and DVB, which will meet the specific needs for the data transmission infrastructure on cable. It is probable that the SCTE efforts will yield proper purchase specifications for the cable TV and data industry.

Control channels

Traditionally, the control channel for analog descrambling converters has been carried on an out-of-band separate carrier in the downstream cable passband. Since that portion of the control channel dedicated to security and access control primarily was dedicated to a single issue, allowing the descrambler to turn on or not, overhead on the channel was minimal relative to that required for digital security.

Satellite, MMDS and satellite master antenna TV (SMATV) delivery systems for MPEG TV signals use an in-band control channel scheme wherein the packets for security or other control functions are inserted into the transport packet stream. At the receiver, a program identification (PID) filter examines the headers of the incoming packets and routes them according to content: video, audio or control. Packets called EMMs (expanded memory manager) and ECMs (error correction modes), which contain key and authorization codes, are routed to the cryptographic processor.

It also is possible to combine these two systems so certain control functionality is carried on an out-of-band carrier, and

Clearly a Winner!

PATENT PENDING

The VTM-200 family features high-resolution images at a winning price!

The *award-winning* VTM-200 Multi-Format On-Screen Monitor family combines crisp waveform, vector, audio, and picture displays on one low-cost SVGA monitor. This ingenious package allows each high-resolution quadrant to be expanded to full-screen.

Members of the VTM-200 family feature different combinations of analog composite (NTSC or PAL) video inputs, 601 serial digital (525 or 625) video inputs and Component Analog Video inputs. Both of the versatile audio options display levels and phase differences on up to four AES stereo pairs and four analog stereo pairs, and one option monitors embedded digital audio. The audio bar-graph has a wide dynamic range and user selectable resolution and ballistics.

A unique ZOOM feature allows ultra-accurate set up and measurement of black, white, and audio reference levels.

Whether your facility is NTSC, PAL, multi-format, serial digital, or in transition, **the VTM-200 family is clearly the winning choice for all your on-screen test and measurement needs.**

Call today to find out more about this and other winning next-generation solutions from Videotek.

Premium Quality, Intelligent Design, Smart Price...That's Videotek.

VIDEOTEK™
A Zero Defects Company

Five Year Warranty
ISO-9001 Certified

243 Shoemaker Road, Pottstown, PA 19464 Toll Free: (800) 800-5719 (610) 327-2292 Fax: (610) 327-9295
Visit us on the Worldwide Web: www.videotek.com

Reader Service Number 49

different cryptographic keys for each differentiated service or tier of channels. This means that each differentiated service or tier is encrypted differently from any other, and if a subscriber doesn't take a certain service, the key to decrypt it is not even present in the home terminal.

Now, what does this mean for in-band vs. out-of-band control channel architecture? If each pay service, each PPV and each differentiated tier of channels has its own unique cryptographic key—which is changed on a fairly rapid basis during each day—a huge overhead is placed on the out-of-band channel during key update periods, which are fairly continuous. Additionally, an extra burden is placed on the home decoding unit to ensure crypto-synchronization during key change periods. Since the proper key is sent in conjunction with the secured video and audio in the in-band case, crypto-synchronization is virtually automatic.

It also is unclear how cable systems that have implemented asynchronous transfer mode (ATM) transport structures for voice, data and video can accomplish out-of-band control, since, by definition, all control is in-band.

A hybrid solution actually may be the best choice in these design considerations. This is where the EMM and ECM packets are sent in-band with the MPEG transport stream, but all other control signals are sent over an out-of-band channel. This takes the burden for key distribution off the out-of-band control channel, but still facilitates other control functions.

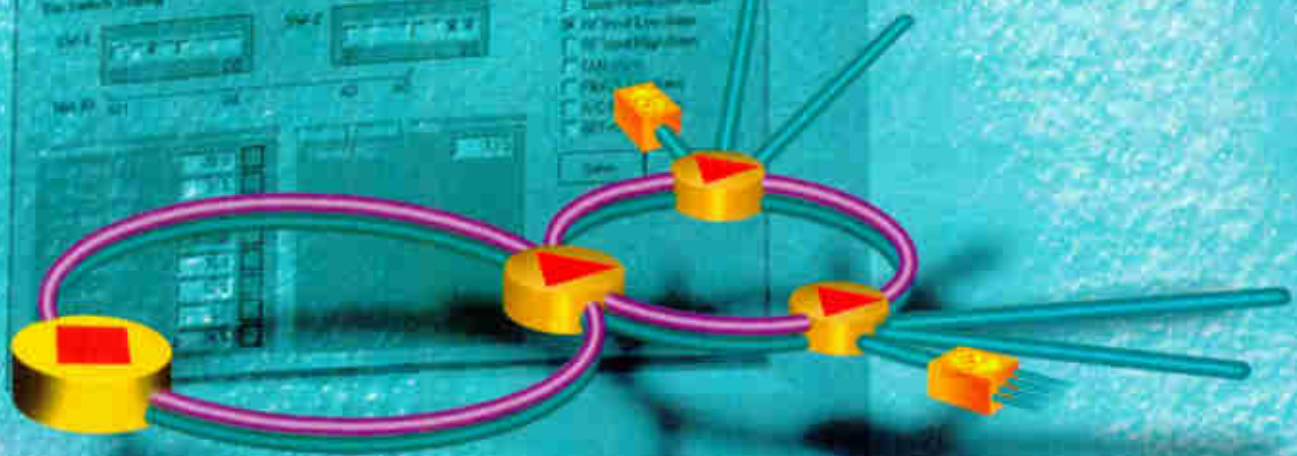
Besides the home terminal's unique control signals sent on the out-of-band channel, other signals such as PPV promotions, local clock, channel maps, purchasing communications, program guide updates, security and usage audits, messaging, and such then could easily be transported on this channel in a global fashion. Sending certain control keys over the out-of-band channel may facilitate compartmentalization of large systems into sub-key regions, to reduce the marketing area of the subscriber/pirate and to provide a unique point of leverage in disenfranchising cloned home terminals.

PPK and symmetric

In private-public-key (PPK) systems, an algorithm is used that has two different keys, one private and the other public. The public key is sufficient to encrypt a message for transmission, but the private key is required to decrypt that message.

So, if Party A wishes to receive communications from Parties B, C and D, Party A sends them the public key part of the key pair, while keeping the private key strictly to himself. Whenever B, C or D wishes to communicate a message to A, they encrypt it with the public key and transmit it to A. Note that while B, C and D all have the same public key, they cannot read each other's messages to A because they do not have the private key. Party A can read any message from B, C or D because A has kept the private key. In a

See your Network in a whole new light.



Silicon Valley Communications offers the most comprehensive line of optical transmission products.

Highest Packaging Density 1310nm Product Line (10 Tx Modules in 3 RU)

Comprehensive Modular 1550 Tx and Optical Amplifier Product Lines

Comprehensive Rack Mount 1310nm, 1550nm Product Lines

Scalable Four Output Node

Universal Chassis

- Capable of housing 1310, 1550 and Return Path product lines

1310nm

- Available in both 1RU and 3RU modular packaging
- Available in 4 to 16dB links
- Highest packaging density (10 Tx modules in 3 RU)
- Superior thermal stability

1550nm Transmitter and Optical Amplifiers

- Available in 1RU and 3RU modular packaging
- Isolated and non-isolated Optical amplifiers
- Range of Optical Amplifiers output (14, 17, 20 and 23dBm)

Nodes

- Cost effective single output with data/video return
- Scalable and compact 4 output node with data/video return
- State of the art Gallium-Arsenide (GaAs) technology

Network Management System

- SNMP compliant
- Single point and click user interface
- 32 bit Windows® based
- Remote access capability

SILICON VALLEY COMMUNICATIONS INC.

3515 Monroe St. Santa Clara CA 95051 • Phone: 408.247.3800 • Fax: 408.247.8689

E-mail: sales@svci.com • svci.com

SILICON VALLEY COMMUNICATIONS

Reader Service Number 51

cable system, Party A would be the headend, and Parties B, C, D, and so on would represent subscribers with digital descrambling converters.

The headend would send each subscriber its public key so that each subscriber terminal could communicate toward the headend either on the return plant or via telephone return, if two-way communication is desired. Each subscriber terminal also would send its public key to the headend, or do so at the time of converter issuance and activation, so that the headend could communicate uniquely to each of the subscriber terminals. This would allow unique control of each unit individually. It also would be possible to have a second PPK system in which the public keys from the subscriber terminals are all the same, allowing a single global message to be sent containing material that all receive, such as clock or channel map.

Symmetric key means that the same single key is used for encryption and decryption. This is much simpler than the PPK approach, but only if you have a method for delivering that symmetric key to each legitimate customer without revealing it to unauthorized subscribers. With symmetric key, each differentiated channel or tier would have just one key per key period, and the problems of key distribution in a PPK environment are eased.

The probable best answer once again is an amalgamation of the two systems. Suppose a cable operator used a PPK system to protect the current operating symmetric keys during their distribution to those subscribers who are authorized to receive them. The symmetric key, encrypted by the public keys from authorized subscribers, then could be delivered without unauthorized subscribers' being able to discern them. Since changing symmetric keys is not required on a continuous—but more of an intermittent—basis, the overhead in the control channel from the PPK system can be reduced.

Taking this one step further, on any given system a limited number of perturbations exist in the possible service personalities available to subscribers. Then, each home terminal could be differentiated based on the service personality group into which it falls. All home

THE CHALLENGE

Design a headend for high signal quality that also minimizes out-of-service conditions and lowers corrective maintenance costs.

THE SOLUTION

PULSAR Modulators from Barco

High signal quality, automatic back-up and remote monitoring in one intelligent modulator

PULSAR modulators provide complete software control, allowing you to monitor and manipulate all modulator functions from a central location. In the event that lost or degraded signal is detected, you can remotely route the signal to a back-up modulator without the expense or delay of dispatching a technician to the headend.

Even better, your subscribers won't experience an extended loss of service.

- Available in fixed frequency or tuneable versions to provide maximum flexibility
- Phase Locked Loop techniques assure long term signal stability
- An intelligent "white limiter" and video AGC prevent overmodulation and automatically optimize the modulation depth for various nonstandard video input signal levels
- Available with BTSC encoder
- Full remote control with ROSA software

Find Out More!

PULSAR is just one of the many BARCO headend solutions that make broadband CATV networks more flexible, efficient and reliable.

And, like all BARCO headend equipment, PULSAR can be remotely monitored and controlled by ROSA, BARCO's CATV network management software. For additional information, visit our Web site at www.barco-usa.com or call 770/218-3200.

BARCO

3240 Town Point Drive
Kennesaw, GA 30144
Tel: 770/218-3200
Fax: 770/218-3250
www.barco-usa.com

Reader Service Number 54

terminals of the same service class could be keyed similarly, if PPV and purchasing are split out and handled separately. This advantage would fall apart in a completely a la carte service rendering.

Anytime a rekeying message is directed to the home terminals (if it is sent under a secure signature mechanism), at least the terminal can ascertain that the message is from the headend and that it has not been modified en route.

One other problem with PPK systems as the single system for encryption in cable TV is that the operations are more complicated and require more processing and transmission time. This overhead increase could become an important factor in control channel access in a PPK-only system.

There are a number of iterations in design concept based on the use of PPK and symmetric key systems. The important thing for the cable operator is to understand how the system works and the amount of overhead left in the control channel for future subscriber-base expansion without rebuilding the conditional access (CA) system.

The use of any of these systems does not obviate the clone terminal threat. In that case, the clone terminal is configured cryptographically just like the pirate's legitimate terminal, and each time the legitimate terminal is given a new key the clones are likewise updated. Other countermeasures are required in addition to the ones discussed here to resolve this threat.

Form factor trade-offs

Two worldwide accepted module formats are candidates for use in cable operating systems, the PCMCIA card and the ISO-7816 chip card. Either one could be made to work for the most simple CA applications. The ISO-7816 card basically is limited to a single 25-square-mil integrated circuit, which is adequate for a straightforward decryptor, such as DES. It may not be adequate to house a simultaneous decryptor/encryptor and secure signature unit with adequate storage for several keys, even with limited or no additional features.

The card has only eight contacts for interface, so the data must be streamed onto and off of the card in serial format. This card has been tested at 50 Mbps serial input/output with good reliability. However, since the security card is intended to be inserted into the socket and left there for long periods of time, perhaps years, it is not known how corrosion at the point of contact between the socket and the contact pad would impair this data rate.

The PCMCIA card has sufficient contact pins so that the input and output data can be sent in byte-parallel, or at least nibble-parallel, format, reducing the impact of corrosion impairment on a single pin. The module also has considerably

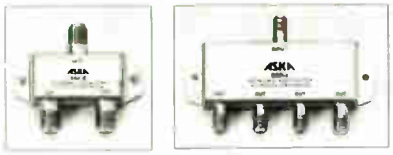
Full Range Solutions . . .

to **MDU** Digital Satellite Distribution for complete line of installation Parts, Accessories and Electronics from

ASKA Communication Corp.

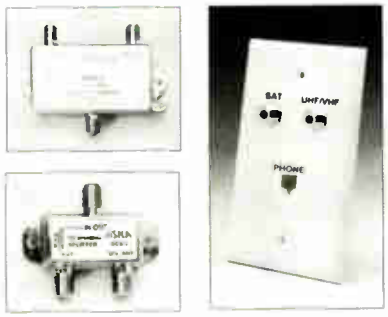
INSTALLATION PARTS

• 950-2050 MHz SPLITTERS



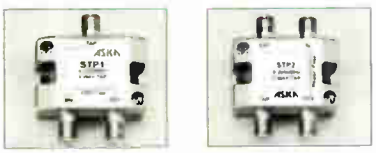
• 40-2050 MHz SPLITTERS

• DIPLEXERS

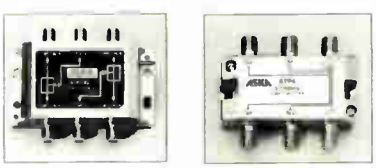


• CONNECTORS GROUND BLOCKS

• DIRECTIONAL TAPS



1-Way Tap | 2-Way Tap



Dual Tap | 4-Way Tap

ASKA offer a variety of products with excellent quality, such as, Connectors, Splitters, Taps, Diplexers, Wall plates, Satellite headend amps, UHF/VHF Amplifiers, Multi-switches, Cascadable multi-switches, Satellite finders, Compasses, and Grounding materials, for Satellite installation.

Contact us for our complete 1998-1999 Product Catalog.

• SATELLITE FINDERS

ASKA COMMUNICATION CORP

Corporate:
Ph: (800) 317-6625 or (954) 486-0039
Fax: (954) 486-0202
www.askacom.com
sales@askacom.com
3540 N.W. 56th Street • Suite 206
Ft. Lauderdale, Fl 33309

National Sales Office:
Ph: (800) 840-6350 or (508) 730-1065
Fax: (508) 677-2511

MULTI-SWITCHES

• CASCADABLE MULTI-SWITCHES

• LAUNCH AMPLIFIERS

• INLINE AMPLIFIERS

Dual Power Supply

more volume than the ISO card, facilitating more complex security schemes and multiple features.

Another option for cable would be to define its own unique module form factor and pin configuration. While this has some desirable features, it presents almost insurmountable problems at the cable/consumer electronics/computer interface and, in the end, would not likely represent any real advantage over using the proven and widely deployed PCMCIA card.

Deployment options

While we are discussing options for moving into the digital security era on cable, a few words regarding deployment are in order. No matter what approach is chosen, everyone in the industry understands that this transition is going to be costly and given to a certain amount of operational disorder. Look over the accompanying table (on page 60) for some options to consider, with probable results.

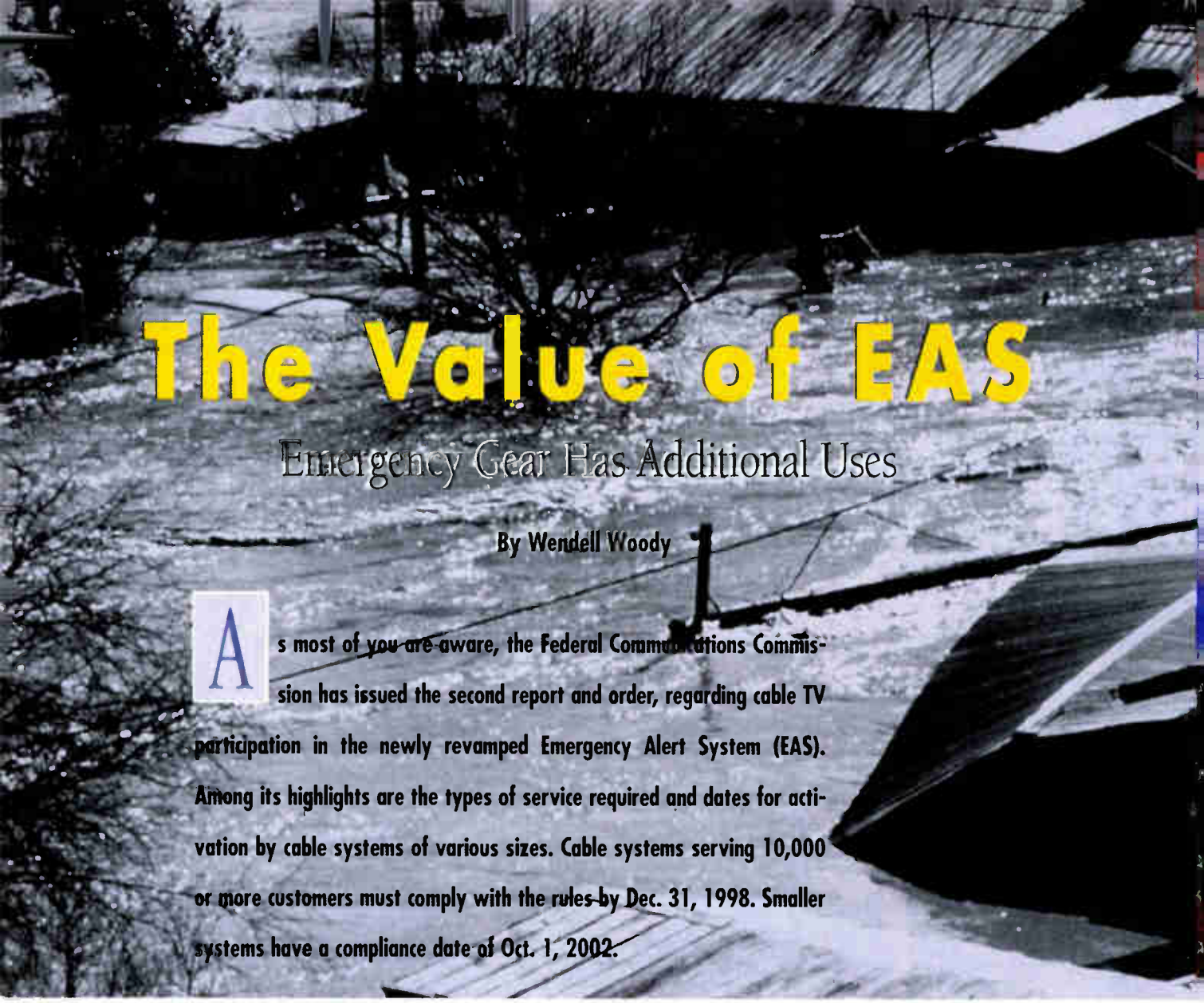
For example, suppose a system were capable of 66 channels, divided into 30 channels in a basic unscrambled analog tier, with the balance scrambled and apportioned into an expanded basic tier, and some number of pay and PPV services. If you chose to approach your digital transition according to the third option mentioned earlier, you might consider the following channel breakout:

- 30 unscrambled analog basic tier services
- 16 channels (96 MHz) of open spectrum dedicated to new digital data services such as high-speed data or telephony
- 120 digital scrambled channels (20 6 MHz channels at 6:1 standard definition TV, or SDTV, compression)

Only those subscribers taking pay services are required to have the digital decoder units, which they can rent or purchase from the cable company, or purchase at a consumer electronics retailer. In either digital case, the cable operator is responsible for furnishing the removable security and access control module to each pay customer. In this scenario, the operator has had a net increase of 100 standard definition digital channels, has retained the 30 channels of analog basic programming for the transition period, and has netted an additional 96 MHz for further digital service development.

A similar case can be made for systems with fewer channels that result in similar proportional gains. To be economically feasible, this scenario supposes that the system operator acquires the digital programming channels in a format suitable for available home terminal units without having to decode and re-encode each digital channel in a new MPEG format, but does require that trans-encryption be performed for every scrambled digital channel. CT

Claude Baggett is director of industry relations at CableLabs. He can be reached at (303) 661-9100.



The Value of EAS

Emergency Gear Has Additional Uses

By Wendell Woody

As most of you are aware, the Federal Communications Commission has issued the second report and order, regarding cable TV participation in the newly revamped Emergency Alert System (EAS). Among its highlights are the types of service required and dates for activation by cable systems of various sizes. Cable systems serving 10,000 or more customers must comply with the rules by Dec. 31, 1998. Smaller systems have a compliance date of Oct. 1, 2002.

While much has been written about cable participation in EAS and the hardware necessary, the focus of this article is how to turn the "dead asset" of EAS into a competitive advantage over delivery systems such as direct broadcast satellite (DBS) and multipoint multichannel distribution service (MMDS), as well as using the EAS hardware (which you'll have to buy anyway) for commercial and promotional purposes. We also will review EAS hardware's value in franchise renewal negotiations and informing customers of system maintenance or program anomalies such as sun outages.

The local angle

Wireless cable providers, regardless of size, need not take part in EAS until Oct. 1, 2002. Even then, DBS systems cannot, and MMDS systems with fewer than 10,000 customers need not, carry anything more than national warnings and the required testing.

You can use these differences to your competitive advantage. Since virtually all activations of EAS are local or regional, cable is the only multichannel delivery system warning the public of local life-threatening situations. For that matter, depending on how active TV stations are in EAS and how well they serve their communities, you could provide better local EAS warning coverage than the broadcasters in your area.

System choices

Many cable systems are wrestling over what kind of EAS system to install. Since every EAS system requires a radio receiver, an encoder/decoder and a character generator, the choice really boils down to the type of override (interruptible) equipment to use. That doesn't mean you shouldn't examine the character generators and encoder/decoders available to determine which best fit your needs—you should. But the real issue is what the equipment will do beyond just providing EAS service.

Certainly, cost is a primary consideration, but think about other system uses when making your choice. IF and RF (comb generator) override systems typically cost less than baseband systems. However, they require that all messages be presented in a full screen method; in other words, they replace the program video with a message. If you plan only to follow minimum EAS requirements, then a full screen interruption is fine. However, if you plan to use the system for nonemergency (especially promotional or commercial) purposes as

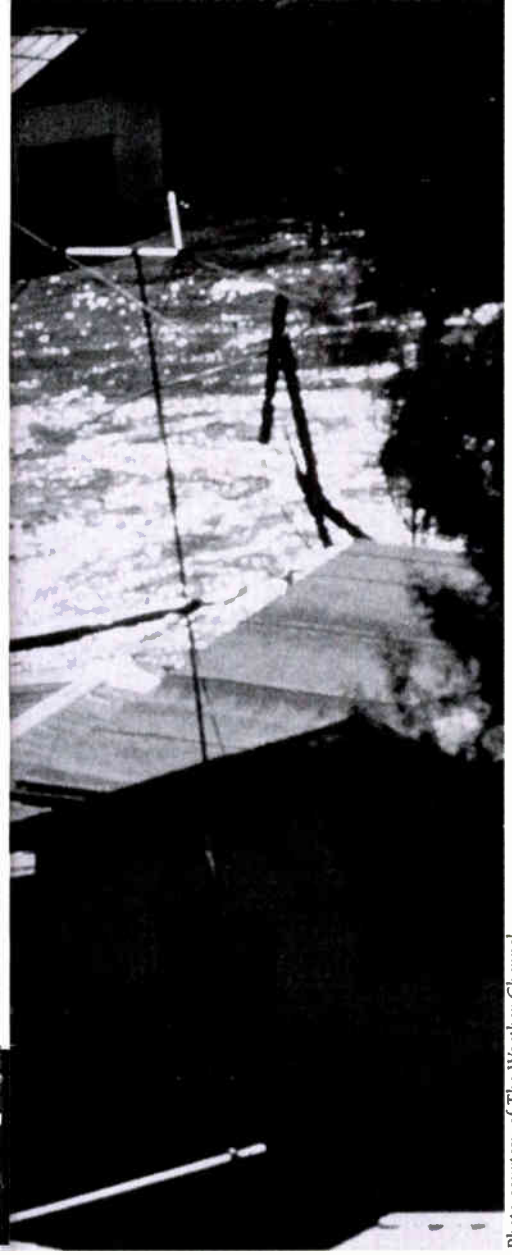


Photo courtesy of The Weather Channel

well, you really need a crawl-system.

If you decide to go the baseband route, you might want to look for certain features. Will the equipment let you customize the crawl message on a channel-by-channel basis? This feature lets you cross-promote programming based on type of programming, such as promoting a pay-per-view sporting event on other sports channels. You also can use this feature to announce channel outages caused by sun outages or system maintenance that is less than spectrum-wide. Some baseband systems allow the cable operator to display icons in a corner of the picture for the duration of the event. This may be useful in locales that suffer from seasonal power outages or "active weather."

Other useful features abound. One is the ability to put up a trouble message when a channel loses its video. Some systems will dial a preselected telephone number to announce the trouble to a duty technician. A feature that is becoming important is the ability to hold both emergency and nonemergency messages when locally inserted commercials are playing. As more and more revenue comes from local advertising, system managers want to avoid costly make-goods on local commercials interrupted by monthly testing or even weather event warnings. Consider a system that lets you defer messages until after the local commercial strings have played.

> "If you plan to use the system for nonemergency (especially promotional or commercial) purposes ... you really need a crawl-system."

It should be noted, however, that you may not "hold" a national warning (Emergency Alert-National, or EAN). Be sure your system can differentiate between EANs and other messages.

You may discover that budget constraints prevent your using a baseband system on all of your video channels. Be sure to acquire a system that permits hybrid approaches, say between baseband and IF switching. If you select such a system, be sure it allows channel-by-channel expansion of crawls as budget and customer demands dictate.

Local government

A final consideration in selecting an EAS system is how it may affect local government entities in your service area. Since EAS has been operating from Jan. 1, 1997, rest assured that your local government will want warning requirements in your next franchise renewal. Consider a pre-emptive strike and offer EAS access before the renewal date, and/or use the offer to negotiate an extension to your existing franchise.

These options require an EAS system that allows access by local government in a manner that is useful to them. Since local government is accustomed to telephone access, be sure that the equipment offers that feature.

Careful review of the EAS system you need, and can afford, will allow you to turn that "dead asset" of EAS into a "living tool" that will benefity-our customers as well as your system's bottom line. CT

Wendell Woody is executive director of broadband technology for Sprint North Supply. He can be reached at (913) 791-6803 or e-mailed at wendell.woody@mail.sprint.com.

BOTTOM LINE

Turn Obligation into Opportunity

Though the Federal Communications Commission soon will require your participation in the Emergency Alert System (EAS), that's not really bad. Since you have to have it anyway, why not use the hardware to make money?

Every EAS system requires a radio receiver, an encoder/decoder and a character generator, so the choice boils down to what type of override equipment to use and what it will do beyond EAS service.

Comb generator (IF and RF) override systems typically cost less than baseband, but they completely replace scheduled programming during the message. Baseband crawl systems run simultaneously with scheduled programs, occupying only a small part of the screen. This feature lets you run nonemergency news and alerts, cross-promote programming, and advise subs of system outages or maintenance. It also can delay some messages to avoid the costs of disrupting commercial strings.

Offering EAS access before your next franchise renewal might help you in negotiations with local government.

Approaching EAS as an opportunity, rather than an obligation, can benefit your customers and your bottom line.

Fiber Splicing Made Simple

By Eve Stroberg

With increasing network demands, MSOs are looking for new splicing methods for faster, simpler and easier installation of their fiber-optic plant.

As with all products, the most successful will be one that is craft-friendly and low in cost. Training also must be simple, with minimal text and easy-to-follow photo illustrations on how to use the product.

Beyond the traditional means of splicing fiber-optic cable using fusion and mechanical splices, a new generation of outside plant connectors is emerging.

These connectors, following in the steps of their ancestors, the traditional-style ferrule connectors, offer some unique advantages for both outside plant and indoor applications. In this article, we will explore this new technology as well as its applications in the ever-changing cable TV network.

A connector, but it's not....

A new and simpler means of connecting fibers offering the same robust body style of the traditional ferrule connector is now available. These devices, known as connection elements, are called nonferrule or ferrule-less style fiber-optic connectors. They operate as a hybrid of a mechanical splice and connector. Their push-pull design makes them similar to an SC style connector, but instead of making a fiber-optic termination with a ferrule-to-ferrule physical contact, the actual fibers meet face-to-face.

Unlike standard optical connectors, the nonferrule connector is intended for field assembly. With the traditional connector that is factory made or made in the field, the basic steps for assembly include:

1) Preparation and stripping of the fiber cable
2) Two-part epoxy for affixing the connector to the cable
3) Oven curing the epoxy to set the connector on the cable
4) Cleaving the glass near the ferrule endface of the connector
5) Multiple polishing steps to achieve the desired endface finish on the connector

Nonferrule connectors actually shorten the average termination process from 15 to 20 minutes per standard termination to one to three minutes. The basic procedures are:

1) Affix and crimp the connector to the fiber
2) Cleave the exposed fiber end
3) Clean the finished termination

In comparison to a fusion splice, a ferrule-less connector could be applied in the time it takes to open a fusion machine and set it up. Other factors such as harsh outdoor environments and availability of fusion gear also make the connection element a logical choice.

How it works

The connection elements or nonferrule type connectors rely on a high-precision alignment mechanism inside the mating adapter. The fibers in the connectors are cleaved on an 8° angle. One end at a time, these connectors are inserted in the adapter for precise alignment. The technology uses "V" groove alignment, which is accomplished by using a series of ball and roller bearings supplying a three-point suspension system. The alignment cavity is encapsulated in a hi-viscosity liquid that provides an environmental seal. (See the accompanying figure on page 74.)

The fibers are maintained in the "V" groove by force applied perpendicularly to the fiber from a mechanical spring mechanism. Axial compressive force on the fiber when the connection elements or nonferrule connectors are in the mated condition provides fiber-to-fiber contact over a temperature range of -40°C to +80°C. In

BOTTOM LINE

Take the Mystery Out of Splicing Fiber

There is no doubt that the installation of broadband systems in the next few years will drive the use of fiber closer and closer to the subscriber. It is estimated that in the next two years the fiber cable market worldwide for single-mode cable will grow from 12% to 17% in each respective year. This increase in turn will drive the need for a robust means of fiber connectorization.

Just like copper networks, the mystery needs to be taken out of handling fiber cable. New means of mating fiber are being reviewed by many manufacturers. The key to success will be the types of splices or mechanical joints that are easy to install, craft-friendly and provide long-term reliability to the network.

Nonferrule connectors offer a means to install fiber quickly at a reasonable price in the field. As MSOs grow and install more fiber, many customers' voice, video and data signals will be riding over one piece of glass. With all of these network demands, the investment in quick-restoration fiber connectors will be a worthwhile investment.

It's Only 19lbs and Battery Operated

But With It's Features and Performance It's No Lightweight!

2-Year Warranty

- In-Service C/N, CSO, Hum and In-Channel Response
- Specifications Met After 1 Minute Warm-up
- >60 dB C/N @ +5 dBmV with no Preamp*
- Durable Water-Resistant Sealed Package
- >70 dB CTB & CSO with no Preselector*
- Fast 3ms Scan Speed With Real Time Display
- -65 dBmV Sensitivity
- Store 100 Measurements and 64 Settings
- Active Matrix LCD Viewable in Full Sunlight
- Dial Up Capability for Remote Measurements

Avantron AT2000R Field Spectrum Analyzer

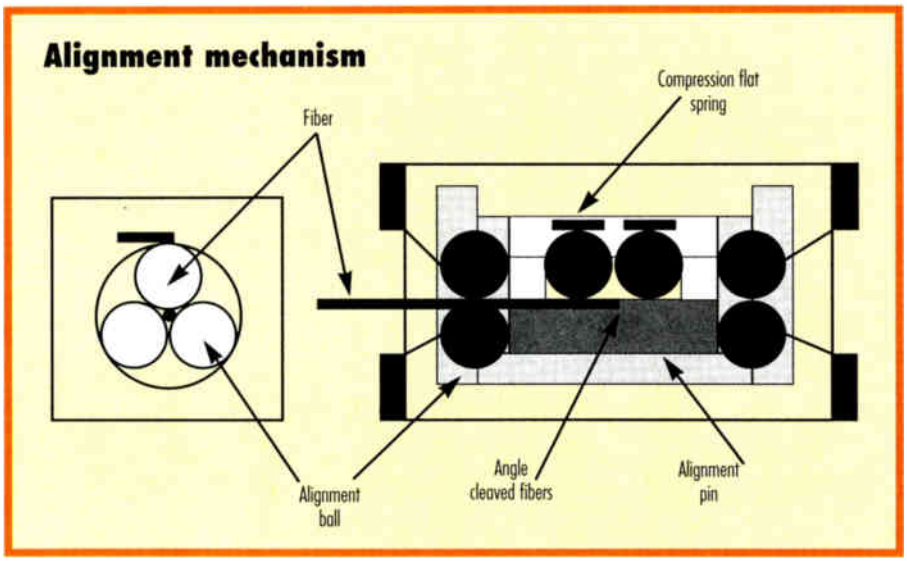
See the instrument everyone is talking about.
Call today for a demonstration on your system!

North America Call 1-800-297-9726
Outside North America 1-514-725-6652
www.avantron.com

Avantron

*Specification with 77 channel loading and no preselector.

Reader Service Number 59



addition to the hi-viscosity index matching liquid in the inner mating chamber, gaskets are used at either end of the device as a sealing barrier to prevent moisture or other contaminants from entering the connection.

With the design of these connectors, their use in the outside plant cannot be overlooked. Because these are sealed connection points, they can be deployed in all types of indoor as well as outdoor splice closures and cabinets. Many cable TV strand-mount closures are of a free-breathing design. This type of product would be a logical choice for quick installation of service while protecting the connection from heat, cold, moisture, dust or other concerns.

Optical performances of this connector are superior to its ferruled cousin. Putting an 8° angled cleave on the fiber has made it the equivalent of an APC style connector with minimum back reflection of 65 dB and an insertion loss of 0.1 dB or better. With multiple terminations, it is possible to achieve losses of 0.03 dB to 0.07 dB. Even under most cable TV loss budgets, the parameters for losses achieved with ferrule-less style connectors allow them to fit into the network without compromising service.

Field installation

Connection elements or nonferrule connectors can be used on all types of fiber—outside plant 250 µm cable, 900 micron tight buffered cable, as well as jumper style cable such as 3 mm jacketed. The procedure is as follows:

1) A boot—either 900 µm or 3 mm jacket style—is placed over one end of the fiber.
2) The fiber exterior coating is removed with stripping tools—either color

coating from the 250 µm fiber or the buffer from a 900 µm style fiber. If the 3 mm jumper cord is used, the outer jacket and Kevlar must be removed to access the 900 µm interior fiber.

3) The fiber is cleaned with a 91% alcohol solution—swipes or bottle-applied may be used.
4) A special adhesive is then applied to the junction of the jacket and the exposed glass, and the connector is placed over the end of the stripped fiber.
5) Once the connector is seated to the end of the buffer, the connector is crimped in two places—once to affix the connector to the buffer on the rear portion of the brass feeder tube, and once in the center of the feeder tube to act as a fiber strain relief for the connector.
6) The boot is then applied to the rear of the connector. The connector now is ready for its final operation—cleaving.
7) The connector is inserted into an 8° angled cleave tool and cleaved with a counter-clockwise turn of the cleaving knob on the tool.
8) The final step before use includes the insertion of the device into a cleaning cassette to remove any debris from the fiber endface of the glass.

Generally, the previous steps take anywhere from one minute to two minutes for the complete operation. This type of technology has proven to be a simple and fast means to mate fiber-optic connectors—with consistency and in large numbers. With the amount of fiber deployed at the typical MSO, fiber failures due to cuts, equipment failures, environmental threats and craft issues will be a constant concern for most operators. Operators need to find ways to quickly restore services.

The advent of wavelength division multiplexing (WDM) and dense wavelength division multiplexing (DWDM) technologies also will compound the need for quick restoration because of the amount of traffic that will be placed over a given fiber. With several different wavelengths carrying voice, video and data channels, more customers and their services will be affected by an outage. A means to restore service quickly will be imperative.

One other advantage of the ferrule-less connector is the minimal amount of tooling required to make a termination. Most tools used in the termination procedure already are familiar to technicians, including crimping tools and fiber stripping and preparation tools. Also, there is no need for any electric power or specialized workstation in the termination process. This is very convenient for using the connector system in a bucket truck or remote field location when restoring fiber service.

Cost comparison

When evaluating the cost of mating optical fibers, one must compare the cost of the materials involved plus the actual labor—start to finish—to actually restore the service. The following examples offer some comparisons between the cost of installing nonferrule connectors vs. regular optical connectors and fusion splices. (See

Table 1: APC style connectors comparison

Operations	Standard connector	Nonferrule
Termination time	20 minutes	5 minutes
Termination cost	$14.85*	$3.75*
Components costs	$25.00	$17.00
Total cost per mated pair	$39.85	$20.75 ea
Total savings: $19.10		
A 48% cost savings		
Optical performance:		
Return loss (RL)	-65dB (typ)	-65dB (typ)
Insertion loss (IL)	0.25dB (typ)	0.10dB (typ)

*Note: A labor rate of $45.00/hr was assumed for field installation. These figures assume a traditional epoxy/oven cured connector and polish using list pricing for both products.

Table 1.)

It is clear that in field applications, the nonferrule is cost-effective in terms of labor costs and component costs combined. If on average you have 25 fiber cable restorations in a month, over a given year, by using the nonferrule system, you can save more than $5,000 in installed labor costs. Beyond the cost savings, the optical performance is enhanced by using the nonferrule connector.

Fusion comparison

In the case of optical performance, it is obvious that fusion splicing will be superior to that of nonferrule connectors. However, as fiber moves closer to the subscriber, the cost of deployment also can be critical. In the example that follows, a cost comparison has been set up to show costs associated with each. (See Table 2 on page 78.)

The comparison involved 1,000 splices in a year and looked at the total cost of deployment including equipment and its depreciation, all consumables, labor and other factors over a three-year period. The nonferrule connectors were definitely a cost-effective option for the long term. This is not to advocate the replacement of fusion and mass fusion splicing with ferrule-less style connectors, but to offer a cost-effective alternative for the long term as an option to fusion splicing for installations of medium to small size.

Applications

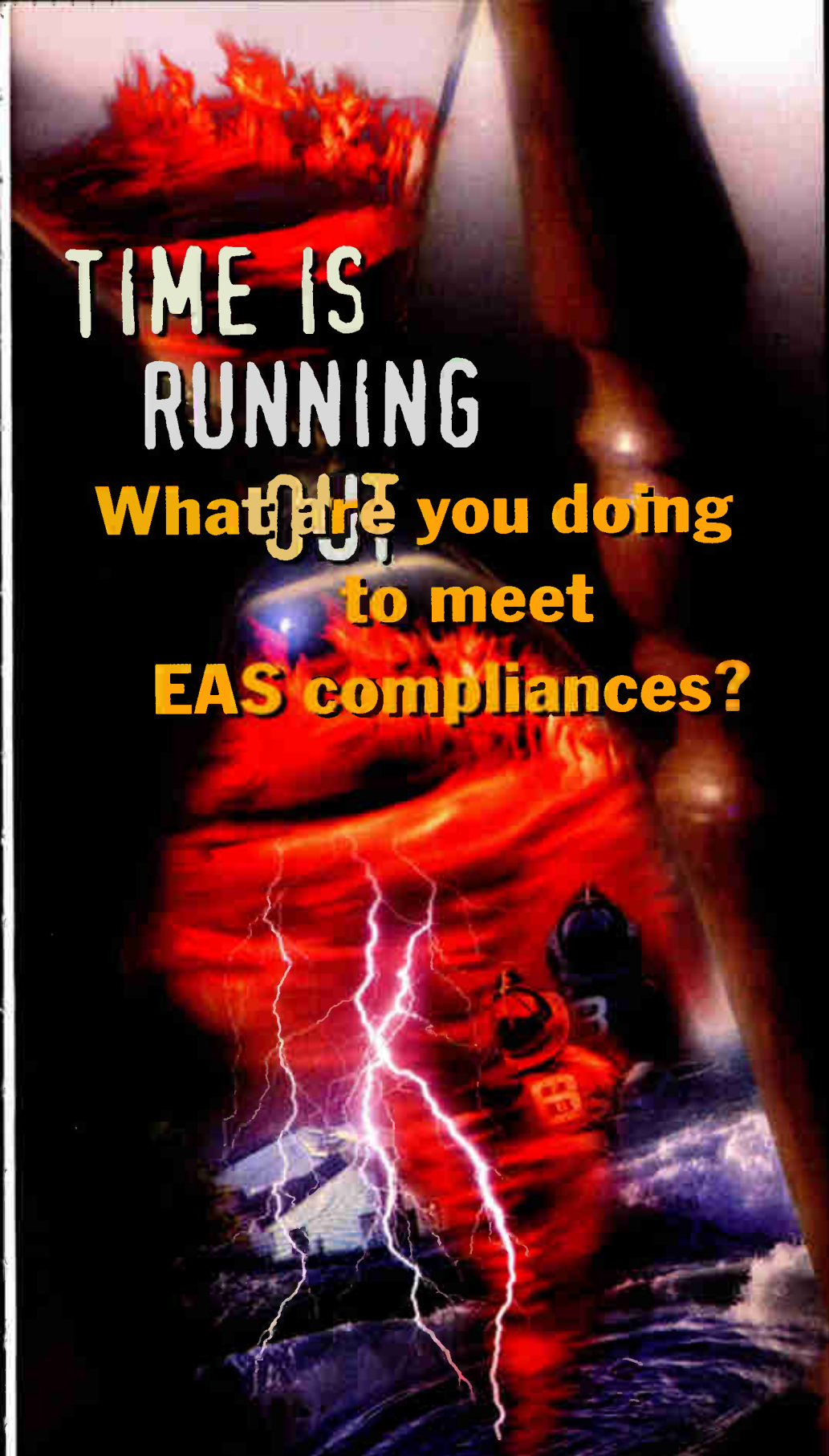
Like fusion splices or standard connectors, nonferrule connectors can be used in the same manner for either restoration or permanent means. Here are a few network applications.

Fiber-optic connector restoration in nodes: With any optical receiver node, there is a possibility to damage or break an optical connector inside the unit when troubleshooting a specific service problem. Even a small error in the general cleaning of the fiber connector could scratch the ferrule endface, causing problems with node transmission and optical performance.

If there is a broken or damaged connector inside an optical node, you have the options of replacing the connector via traditional means or fusion splicing a new pigtail inside the node. Both methods probably would mean having to take the node off the strand and bringing it down to a fusion truck to reterminate the fiber.

With nonferrule style connectors, this fiber repair could be made simply and quickly—even while the node is on the strand. Since this connection system requires no power or special tools, the fiber can be repaired in the air in a bucket truck. Not removing the node from the support strand allows on-site repair, saving any operator two to three hours' additional labor. Depending on prevailing wage rates, this labor savings could mean more than $150 to $200 in the repair of one fiber.

Fiber restoration in hubs/headends for optical termination cabinets: In most optical headend or hub sites, fiber-optic preterminated or pigtailed cross-connect shelves are installed as the interface to the outside plant cable. In many cases, if someone has been working in the rear of the shelf, a fiber could be fractured or broken. Again, the options of repair are a fusion pigtail or the termination of the new connector on the end of the fiber. Some of the issues surrounding this repair include access to a fusion machine (most are out in the field) and the lack of termination equipment to replace the broken connector. Nonferrule connectors can be your answer to this. A small kit can be kept in



The winds of change are upon us. On December 31, cable and wireless operations must be in compliance with the new Emergency Alert System requirements. For you, it means more work and some new equipment.

Don't panic.

FrontLine has everything you need. We're the EAS specialists, and we can advise on and supply the best solution for your operation—whether it's baseband switching, IF, text messaging or a combination of these.

Our patented All Channel Messaging (ACM) system is loaded with functionality to take you beyond EAS. You can use it for the community bulletin board or local sports scores. Better yet, use it to advertise and switch that pay-per-view special.

FrontLine is dedicated to innovations in EAS technology. For instance, we are the only company offering a Digital EAS system. And we're rising to new levels with Audio-Tag™, providing revenue generating sponsorship of EAS tests and alerts as a standard feature, and FrontPager™, an automatic EAS paging system.

FrontLine: the source for all your EAS needs.

FrontLine, one stop shopping, one call service.

Call now for a free EAS consultation.

(800) 231-1349 • (801) 464-1600 • Fax: (801)464-1699

www.frontlinecom.com • info@frontlinecom.com

Reader Service Number 62

FRONTLINE
COMMUNICATIONS
MAXIMUM INFORMATION
MINIMUM INTERRUPTION

Table 2: Fusion to nonferrule connector cost comparison (per 1,000 splices)

Fusion splicing			
Requirements	First year	Second year	Third year
Splicing machine	$25,000	$20,000	$17,000
Protection sleeves	$500	$500	$500
Splice trays	$1,500	$1,500	$1,500
Cleaver	$1,500	$1,000	$750
Labor	$7,500	$7,500	$7,500
Total	$36,000	$30,500	$27,250
Cost per splice: $36 to $27			

Nonferrule connectors			
Requirements	First year	Second year	Third year
Mated pair	$17,000	$17,000	$17,000
Tool kit	$2,000	$2,000	$2,000
Labor	$3,750	$3,750	$3,750
Mounting	$833	$833	$833
Total	$23,583	$23,583	$23,583
Cost per splice: $23.58			

Notes
1) Used splice sleeves: 50 cents each
2) Used plastic tray to hold heatshrink sleeves: $35 each
3) Labor @ $45/hour: Estimate 10 minutes per fusion splice; five minutes per nonferrule connector
4) Nonferrule mated pair: $17
5) Nonferrule tool kit: $2,000
6) Nonferrule enclosure mounting brackets: $5 each

a headend or hub site for such emergencies to obtain immediate service through the fiber—even if the operator wants to come in at a later date and restore service permanently with a fusion pigtail. The cost of a fusion machine vs. this type of kit ($25,000 vs. $2,000) should make this alternative fit into most capital budgets.

Fiber cable cuts on indoor or outside plant: A cable cut poses a problem to any operator. Whether it be a backhoe cut from a construction site to a bad storm, there will be a need to restore service to a few select fibers as quickly as possible.

Most operators use mechanical splices for a quick temporary fix. As with most mechanicals, their long-term use always has been an issue. They also have a strong craft sensitivity aspect to their termination procedure. Often it is difficult to verify if the fibers are actually touching or have made a positive enough physical contact for the necessary back reflectance measurement desired.

In using nonferrule connectors, the actual terminations leave no guesswork to the field installer. By following the termination procedures, the craft person can put a connector on in minutes and regain service by plugging the end into its mating adapter. Also, the angle cleave with the system offers excellent termination for a mechanical device.

The connection system also handles the elements better than regular connectors. The sealed mating technology allows for environmental exposure without causing problems to the actual connection. Finally, the connections may be used in traditional outside plant enclosures by requesting special mounting brackets from the manufacturer.

Premises drops/fiber installation for schools and businesses: As more fiber is brought into buildings, technicians will be looking for a fast and effective means to deploy services quickly. Another consideration as fiber reaches the premises is security.

With traditional connectors, service can be tampered with or destroyed if the wrong individuals have access to the equipment closets or enclosures on-site. Nonferrule connectors can offer an alternative to the traditional means of bringing fiber into a premises. Not only does the design make it difficult for theft of service, but it can also eliminate the need to use traditional fusion splicing to make outdoor-to-indoor cable compression.

Fiber can be brought in a tight sheath application to a distribution enclosure and be terminated in the cabinet. This can be a good alternative for bringing fiber into campus environments, business or public environments. Nonferrule connectors offer easy installation and a priority design. CT

Eve Stroberg is senior industry marketing manager for Molex Fiber Optics Inc. She can be e-mailed at estroberg@molex.com.

They're 30 Feet up in the Wind, There's Snow on the Ground, and They're Performing an

AERIAL TAUT-SHEATH SPLICE...

WITH A MASS FUSION SPLICER

ARE THEY CRAZY?

Well, no, actually they aren't. That's because they are using the only mass fusion splicer designed specifically to tackle this job.

The Fujikura FSM-30R12 was engineered to be portable with all the features needed in the most trying field conditions.

For more information call:

1-800-AFL-FIBER (ext.#2)
or 1-864-433-0333

Alcoa Fujikura Ltd.
ALCOA **Telecommunications Division**

e-mail: aflfiber@ssw.alcoa.com • P.O. Box 3127, Spartanburg, SC 29304

With only a twenty inch taut-sheath opening (cut in the center for no dead fiber in either direction), the FSM-30R12 design gives you at least 3 splice attempts.
Try that with a conventional mass fusion splicer!

How Do We Get

By David Lin

With the Data Over Cable Service Interface Specification (DOCSIS) standard close at hand and full-fledged cable modem certification slated to become a reality this summer, what else needs to take place for mass deployment? Quite a number of things, actually. And most of them have to do with choosing retailers and then getting them up to speed.

Ideally, consumer electronics retail stores would be the main channel for mass modem distribution. However, computer retailers may be more qualified for the task, at least in the short term, because of their technical orientation. And installing cable modems is a fairly technical endeavor.

Installation complexities

Cable modem installation generally requires two technicians—one to handle the cable setup and another to configure the customer's personal computer (PC).

The cable technician installs the cable outlet (and cable extension if the PC and the cable outlet are located in different rooms). If high pass filters are present, the technician has to remove them and then ensure that both upstream and

To Cable Modem Retail Sales?

Despite Hurdles, the Future Looks Bright

downstream signals transmit at proper levels. The technician verifying connectivity should possess either Installer Certification or Service Technician Certification from the Society of Cable Telecommunications Engineers.

The second technician installs the Ethernet network interface card (NIC) into the PC and configures the network software. The installation process also may include on-site troubleshooting of the PC hardware and cable modem. A technician skilled in both networking and PC operation should be able to complete the entire installation in about 30 minutes, perhaps longer if problems crop up.

Potentially, cable modem installation—from in-home wiring and verification to NIC installation and software configuration—could stifle cable modem retail sales. Although high volume production and highly integrated electronics have helped reduce cable modem prices, average installation fees still hover around $120 to $150. Unless the installation fee can be substantially reduced, the combined cost of the modem and its installation will be prohibitive to many buyers.

Another potential bottleneck is that the installation process requires three rather disparate skill sets: cabling experience, networking and PC skills. In-home wiring is unfamiliar to most consumer electronics and computer retailers, and NICs rarely are seen outside the local area networks (LANs) of the business environment. Few retailers have the combination of skills required to install cable modems successfully in residences, which also could inhibit modem sales.

Making retail work

Modem vendors and MSOs need to work together to select retailers whose technicians can be trained quickly. A technically strong retailer most likely will be able to launch the retail more smoothly than others. Overall, computer retailers may be more technically qualified than consumer electronics retailers. Regardless of which retail outlets are selected, MSOs, modem vendors and retailers will need to work closely together to ensure success.

> "Many benefits will attract retailers to sell cable modems and customers to try them out."

Installation aside, customer support and sales training will require detailed planning before launching cable modem retail sales. Customer support requires that retailers be able to deal with such issues as manufacturing defects or customer-generated problems. In most cases, retailers will be the first to address problems, so they will need training to do so. Subject to prearranged agreements, the modem vendor should be the second line of customer support when there are problems, such as part replacement or software damage. Either the cable operator or the modem vendor can provide sales training so that the retailer can offer effective customer support.

Promotion

How to promote DOCSIS cable modems is another strong challenge. Without active marketing, promotion and education, deployment will not ramp up quickly. There are a number of ways to promote cable modems at the retail level. MSOs can use bill inserts, direct mail, TV and radio spots and direct sales. Retailers can use door hangers, newspaper ads and billboards. Also, in-store live demonstrations will be a very effective way to sell the cable modem. People must see it to believe it. Today, consumers are accustomed to the traditional analog telephone modem. Without sufficient education and promotion, consumers may not be aware of the advantages of the cable modem over the phone modem.

Furthermore, cable modems are facing strong competition from digital subscriber line (xDSL) service that telephone companies are actively introducing to the market. The advantages of the DOCSIS cable modem over xDSL are early availability, lower price and lower monthly service charges. However, unless MSOs, retailers and vendors all work together to provide a solid marketing plan and sound training, cable modem retail deployment may not be as smooth as we would like.

In spite of the challenges of installation, customer support, sales training and promotion, many benefits will attract retailers to sell cable modems and customers to try them out. Benefits for retailers include more customers, increased revenue and an enhanced image. According to MSOs, users of early proprietary cable modems like them because they offer high-speed Internet access, don't tie up a second phone line, are always on and provide local connection. The benefits of using standards-based DOCSIS cable modems will be even greater, since they have many improvements over proprietary modems. These

BOTTOM LINE

Retail Cable Modems

Many obstacles remain in the path of retail cable modem sales, and clearing them away will require teamwork and planning. Following are some challenges and potential solutions.

Cost: Average installation fees hover around $120 to $150. Unless this cost can be reduced, the combined price of the modem and its installation will be prohibitive to many buyers.

Skills: Installation requires the three disparate skill sets of cabling experience, networking and PC skills. Few retailers have all three, which also could inhibit modem sales.

Cooperation: Modem vendors and MSOs need to work together to select retailers whose technicians can be trained quickly. A technically strong retailer is more likely to launch the retail smoothly than others. Either the cable operator or the modem vendor can provide sales training so that the retailer can offer effective customer support.

Promotion: Without active marketing, promotion and education, sales will be slow. There are a number of ways to promote cable modems at the retail level. MSOs can use bill inserts, direct mail, TV and radio spots and direct sales. Retailers can use door hangers, newspaper ads, billboards and in-store demonstrations.

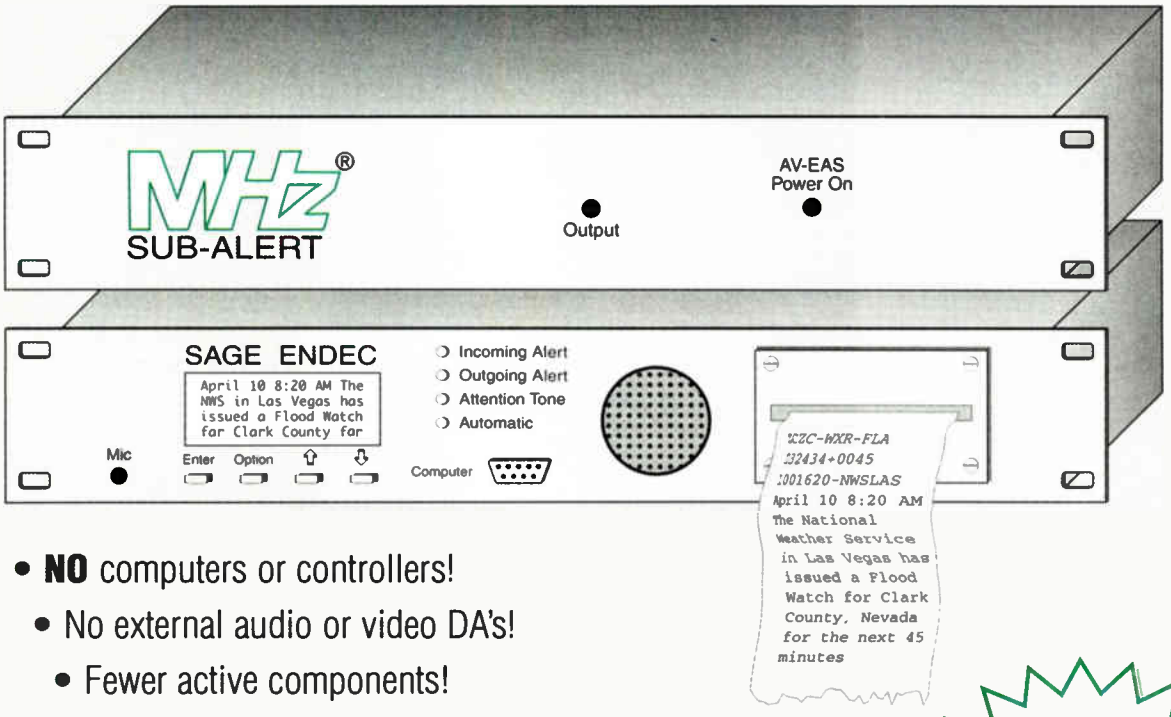
benefits include higher throughput, remote configuration, and software field upgradability. Most importantly, Web surfers who have been suffering "World Wide Wait" can escape the increasingly frequent traffic jams on the Information Superhighway.

David Lin is director of marketing and business development for the Networks Divison of Samsung Telecommunications America. He can be e-mailed at dlin@sisa.samsung.com.

THE "SUB-ALERT"

Emergency Alert System Challenge

CAN ANY OTHER SYSTEM STAND-UP TO OUR CHALLENGE?



- **NO** computers or controllers!
- No external audio or video DA's!
- Fewer active components!
- **Selective channel switching by event!!**
- Highest technical specifications in the industry!
- Fewer "IF" or baseband cables!
- Fewer connections!
- Will display: tests in green, watches in yellow, and warnings in red!
- "Only" professional rackmounted switching!
- The only "IF" system that can be completely balanced w/o disconnecting any EAS cables!!
- The only EAS system with the extraordinarily powerful SAGE "ENDEC"!!
- Longest warranty available!

Don't Be Fooled
EAS

Now With Multiple or All Channel Crawl!!

MHz® MEGA HERTZ®
Established 1975
http://www.megahz.com

® "Unique" Products For the 21st Century!

DENVER ,CO
800-525-8386
FAX 303-779-1749

ATLANTA, GA
800-962-5966

ST. LOUIS, MO
800-821-6800

OCALA, FL
800-922-9200

INDIANAPOLIS, IN
800-761-7610

PHOENIX, AZ
800-883-8839

AD INDEX

Reprints	(301) 340-7788, ext. 2009
List Sales	(301) 340-7788, ext. 2026
Customer Service	(800) 777-5006
Merchandise/Back Issues	(800) 877-5188
Editorial	(301) 340-7788, ext. 2134
Advertising	(301) 340-7788, ext. 2004

SCTE INSTALLER PROGRAM INFORMATION REQUEST CARD

The SCTE Installer Certification Program was created to establish minimum skill requirements for CATV installers and installer/technicians. Participants in the program must successfully complete practical examinations in the areas of cable preparation and meter reading, as well as a written examination on general installation practice. The program is being administered by local SCTE chapters and meeting groups under the guidance of SCTE national headquarters. All candidates for certification in the program are recognized as SCTE members at the Installer level, and receive a copy of the *SCTE Installer Manual*.

☐ Please send me information and an application for the SCTE Installer Program

Name _____

Address _____

Phone ( ) FAX ( )

SCTE®

The Society of Cable Telecommunications Engineers
"Training, Certification, Standards"

Mail to:
SCTE
140 Philips Rd., Exton, PA 19341-1318
OR FAX TO: (610) 363-5898

Manager, Communications Operations

Cedar Falls Utilities has an immediate opening for a Manager of Communications Operations. Interested candidates should have success in the management of a broadband communications network, plus a technical and operational background in cable television, data services or telephone operations. University degree required. Comopensation offered is 60 K for the fully qualified candidate. Includes a comprehensive employee benefits and relocation package.

Please send introductory letter and resume to:

PERSONNEL MANAGER
CEDAR FALLS UTILITIES
P.O. BOX 769
CEDAR FALLS, IA 50613

WHITE MOUNTAIN
fiber optics **cable** CONSTRUCTION CORP.

A leader in the Telecommunications Industry, based in Epsom, New Hampshire.

W.M.C.C. currently has major construction and maintenance projects throughout the U.S. With the enormous growth we have experienced over the past year, we continue looking for dedicated, hard-working individuals for various projects throughout the U.S.

With offices located in:

Dallas, TX	Charlotte, NC	New England Region
(817) 465-8822	(704) 708-5124	(800) 233-7350

Experienced Supervisors, Foremen, Linepersons, Splicers and Sub-Contractors call the number nearest you for more information.

W.M.C.C. offers competitive benefits and compensation.

TESINC

6523 N. Black Canyon Highway
Suite 200
Phoenix, Arizona 85015
(602) 242-8110 FAX (602) 242-8227

t•e•s•i•n•c
A Dycom Company

CATV IMMEDIATE OPENINGS in WA

- RF ENG's — LODE DATA, MDU
- INSTALLERS — TRUCK & TOOLS
- INSPECTORS — AERIAL UG, MDU
- DRAFTERS — AUTOCAD, CATV & TELEPHONE
- TECHNICIANS — HEAD END, SWEEP/FCC PROOF, SERVICE

An Equal Opportunity Employer

Call Judi: 1-800-800-7886

Thomas&Betts

PRODUCTION DESIGN ENGINEER

THOMAS & BETTS, a Fortune 500 company of Horseheads, NY is seeking a qualified Product Design Engineer to join our Design/Sustaining Engineering Department. The qualified Candidate would possess a BS/BA in Mechanical, Electrical, or Physics degree. A strong mathematical ability, with courses in materials, mechanics, statics, and dynamics, etc. Computer literacy and working experience with office software and advanced design packages, CAD system (i.e. Pro-Engineer). Thomas & Betts strives to have a teamed environment. If interested resumes are accepted at:

Thomas & Betts Corporation
Attn.: HR Office
PO Box 111
Horseheads, NY 14845
FAX (607) 796-5781 EEE/AA
Website: WWW.TNB.COM
E-Mail: SOBRIEN@TNB.COM

CATV SYSTEM DESIGNER

CableAmerica has an opening for an experienced CATV System Designer in the Phoenix, Arizona area. This position is responsible for CATV design, design drafting and may include field work. Experience with Autocad 12 and Signal cable plant design software preferred. Excellent benefits including 401k.

Please send resume with salary requirements to: CableAmerica, 1755 S. Horne, Ste. 201, Mesa, AZ 85204 or fax to 602.892.7775

CableAmerica

SCTE Sustaining Member

Peter Froehlich & Co. Executive search

P.O. Box 339 Weatherford, TX 76086
(800) 742-4947 FAX (817) 594-1337
email: pfsearch@flash.net
web: http://www.flash.net/~pfsearch

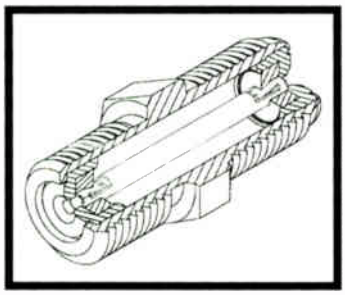
All levels of Technical Positions - Corporate to Hourly. Operators and Manufacturers Call or Write. Fees Paid.

CATV PROJECT MANAGERS

We are a leader in the Telecommunications Industry, looking for dedicated and successful Project Managers, who are committed to excellence. Project Managers will be responsible for the completion of upgrade and rebuild projects. Construction projects will include aerial and underground placement of fiber and coaxial cable, node activation as well as power supply construction. Managers must have demonstrated successful planning, directing and coordination of construction projects. Please forward resumes to:

Project Manager CTM
PBI, 1900 Grant Street, Suite 720
Denver, CO 80203

CAREER OPPORTUNITIES



F-Splice

Improvements to a patented high return loss F-splice from Holland Electronics Corp. include using a round, beryllium copper sizing pin that can hold more than 200 grams while providing in excess of a 30 dB return loss at 2 GHz. The increased holding power of the G-F81 also reduces intermodulation distortion generated from oxides or corrosion junctions between the sizing pin and cable center conductor in high output situations. This product also is available in a bonding block configuration.

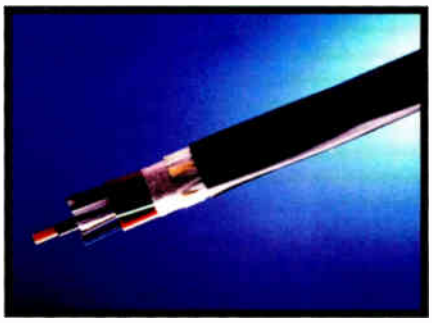
Reader Service #312

T1/ISDN Protectors

The MODF2-T1 Protector from ITW Linx Communications Products protects T1 and integrated services digital network (ISDN) electronic network interface equipment from damage from transient overvoltage surges and overcurrents without attenuating the data.

The units use RJ45 connectors in a two-pair module. The protectors' solid-state circuitry passes data at 1.5 MHz or more without signal degradation and responds to transient voltages in less than 2 to 5 nanoseconds, automatically resetting for continuous protection.

Reader Service #309



Fiber Cable

Company officials say that Pirelli's new 720 Fiber Ribbon in Loose Tube (RILT) offers the highest fiber count of any such cable commercially available in North America.

The new design incorporates Pirelli's reverse oscillating lay technology for better fiber management and mid-span open access. A high fiber count within a small diameter makes it easy to handle at any angle.

The 720 Fiber RILT gives the end user a 67% higher capacity in a conventional 1.25-inch duct over 432-fiber cable.

Also new from Pirelli, KleenCore technology eliminates core flooding gels and allows more efficient cable preparation. The MarineCore option protects from moisture specific to harsh ground and salt water environments.

Reader Service #310

Pressure Switches

It may be 96 degrees in the shade, but Model E switches from the Henry Dietz Co. detect latent heat and other temperature-related threats to small, expensive and often vulnerable electronic equipment.

Officials say these pressure switches often are used as replacements for smaller switches that, because of size limitations, require 2.5 times more pressure for actuation. The switches are supplied with normally closed gold contacts that are open when there is proper airflow, which creates low operating pressure.

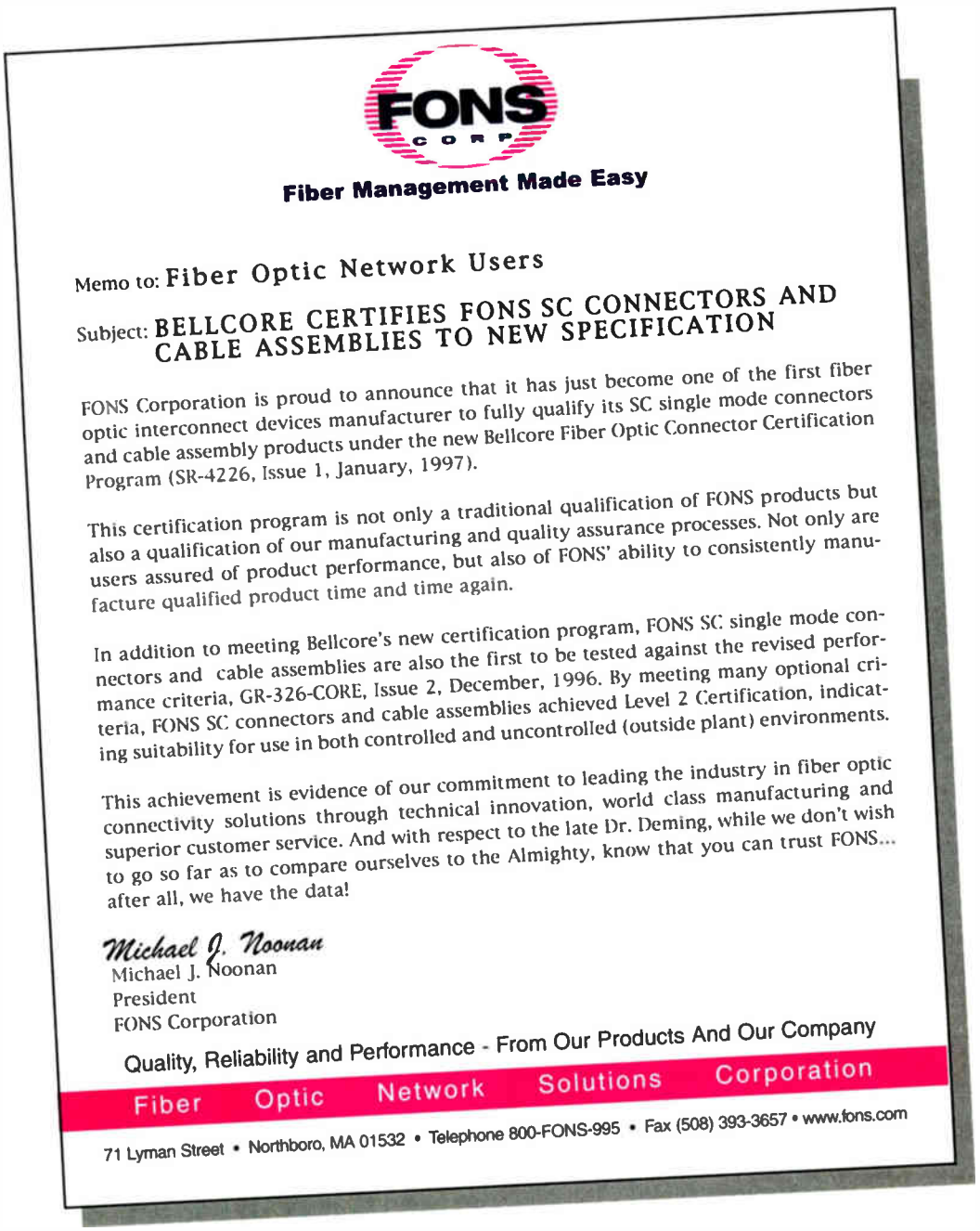
Since the switch was made for low voltage and current use with logic circuits, the normally closed contacts easily can be designed by the user to function as normally closed contacts when there is airflow.

Special Model E switches are available for 120 VAC use, requiring that the switches be connected in series with the load and supplied with an alternating current. They're able to carry two amperes of current at 120 VAC and are available in circuit configurations that are similar to those in a normally open or closed switch.

Reader Service #311

"In God we trust... all others must have data."

W. Edward Deming



FONS CORP

Fiber Management Made Easy

Memo to: Fiber Optic Network Users

Subject: BELLCORE CERTIFIES FONS SC CONNECTORS AND CABLE ASSEMBLIES TO NEW SPECIFICATION

FONS Corporation is proud to announce that it has just become one of the first fiber optic interconnect devices manufacturer to fully qualify its SC single mode connectors and cable assembly products under the new Bellcore Fiber Optic Connector Certification Program (SR-4226, Issue 1, January, 1997).

This certification program is not only a traditional qualification of FONS products but also a qualification of our manufacturing and quality assurance processes. Not only are users assured of product performance, but also of FONS' ability to consistently manufacture qualified product time and time again.

In addition to meeting Bellcore's new certification program, FONS SC single mode connectors and cable assemblies are also the first to be tested against the revised performance criteria, GR-326-CORE, Issue 2, December, 1996. By meeting many optional criteria, FONS SC connectors and cable assemblies achieved Level 2 Certification, indicating suitability for use in both controlled and uncontrolled (outside plant) environments.

This achievement is evidence of our commitment to leading the industry in fiber optic connectivity solutions through technical innovation, world class manufacturing and superior customer service. And with respect to the late Dr. Deming, while we don't wish to go so far as to compare ourselves to the Almighty, know that you can trust FONS... after all, we have the data!

Michael J. Noonan

Michael J. Noonan
President
FONS Corporation

Quality, Reliability and Performance - From Our Products And Our Company

Fiber Optic Network Solutions Corporation

71 Lyman Street • Northboro, MA 01532 • Telephone 800-FONS-995 • Fax (508) 393-3657 • www.fons.com

Bellcore

Bell Communications Research

BOOKSHELF

The following is a listing of some of the books and videotapes currently available by mail order through the Society of Cable Telecommunications Engineers. The prices listed are for SCTE members only. Nonmembers must add 20% when ordering.

- *Electronic Communication Systems, Fundamentals Through Advanced, Third Edition*—This book by Wayne Tomasi introduces the basics of electronics and data, expanding the reader's knowledge to more modern digital and data communications systems. (Hardcover, 880 pages.) Order TR-31, $87.
- *Broadband Return Systems for Hybrid Fiber/Coax Cable TV Networks*—This book by Donald Raskin and Dean Stoneback is a complete guide to designing and deploying the two-way cable systems that support tomorrow's most exciting applications. For cable operators, it provides a complete primer on two-way services, capacity and equipment planning, performance analysis, setup and maintenance. System designers will gain an in-depth understanding of equipment requirements for the headend, distribution system and the home. (Hardcover, 298 pages.) Order TR-32, $50.
- *DigiPoints Volume One*—This book by Justin Junkus and Michael Sawyer provides working information on the challenges and opportunities of digital technology. It gives valuable training on the basics of digital theory, digital transmission technology and its applications in broadband communications. (Hardcover, 350 pages.) Order TR-33, $45.
- *Basics of Digital and Transmission*—Featuring Brian James and John Vartanian. This workshop provides an overview of digital compression and transmission, including associated problems and solutions. Other topics include the nature of analog and digital signals, noise, sampling and quantizing, economics, explanation of compression and techniques, trellis coded modulation, burst error, interleaving, and impact of digital transmission on troubleshooting techniques. (80 min.) Order T-1154 , $45. CT

Note: The videotapes are in color and available in the NTSC 1/2-inch VHS format only. They are available in stock and will be delivered approximately three weeks after receipt of order with full payment.

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

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

NEW and REFURBISHED

IRD's VCII's RECEIVERS

TULSAT TULSAT TULSAT TULSAT TULSAT TULSAT TULSAT

GENERAL INSTRUMENT

IRD w/VCII Card

$499

SCIENTIFIC ATLANTA

NEW 9660 IRD's

Professional & Dual Audio

Refurbed 9650 IRD's

SCIENTIFIC ATLANTA

NOW

Over 3000 in Stock

9660 9650 9640 9630

R. L. DRAKE

Refurbed 1240 Receiver

$195

DESCRAMBLERS

VCII White Label

$179

VCII Plus

$349

NEW IRD w/PLUS CARD

$699

Pico 4200

SCIENTIFIC ATLANTA

9630 Receiver

6650 Receiver

$195 Refurb

DIGICIPHERS

DSR1500 & 2200

DSR4400

DSR4500

DX IRD's

DX IRD 1's & 2's

DX IRD 647

DX IRD 747

FACT

LESS THAN **$100.00** Average *Repair Charge* Including Parts

Modulators Processors Receivers Line Gear IRD Cards VCII's

1605 E. Iola
Broken Arrow, Ok 74012

800-331-5997

We Repair
VCII White Labels

TULSAT TULSAT TULSAT TULSAT TULSAT TULSAT TULSAT

CALENDAR

July

7: Northern New England Society of Cable Telecommunications Engineers Chapter testing session, Windham, ME. Installer certification examinations to be administered. Contact Mike Sanchez, (207) 942-4661.

8-10: Wireless Cable Show, Philadelphia. Call (202) 452-7823.

9: Magnolia SCTE Chapter testing session, Jackson, MS. Installer, BCT/E, Service Technician and Telephony certification examinations to be administered. Contact Bob Nunn, (800) 874-5649.

14-16: C-COR Two-Way Broadband Network Seminars, Minneapolis. Call (800) 233-2267, ext. 4422.

15: Lincoln Land SCTE Chapter vendor show and cookout, Holiday Inn, Bloomington-Normal, IL. Topic and speakers to be announced. Cable-Tec Games will be conducted. Contact Brenda Bangel, (800) 367-1450.

16: Cascade Range SCTE Chapter testing session, Bend, OR. BCT/E certification examinations to be administered. Contact Jeff Keller, (541) 382-5551.

18: Chapparal SCTE Chapter technical seminar, Jones Intercable offices, Albuquerque, NM. Topic: "System Architecture" with speakers to be announced. Contact George Kennison, (505) 761-6205.

20-22: International Engineering Consortium xDSL ComForum, Chicago. Call (312) 559-4600.

20-23: New England Cable Television Association, Newport, RI. Call (617) 843-3418.

21: Penn-Ohio SCTE Chapter golf outing, Conley's Resort, Butler, PA. Contact Marianne McClain, (412) 531-5710.

24: Great Lakes SCTE Chapter technical seminar. Location, topic and speakers to be announced. Contact Mary Gilliland, (810) 726-6886.

27-31: Fiber U and Wire U, Boston. Call (800) 537-8254.

31: Wheat State SCTE Chapter testing session, Great Bend, KS. BCT/E certification examinations to be administered. Contact Joe Cvetnich, (316) 262-4270. C_T

Planning Ahead

Sept. 22-24: Great Lakes Cable Expo, Chicago. Call (317) 845-8100.
Sept. 30-Oct. 1: Private and Wireless Show, Dallas. Call (713) 975-0030.
Oct. 13-15: Mid America Show, Kansas City, MO. Call (913) 841-9241.
Oct. 26-28: Eastern Cable Show, Orlando, FL. Call (404) 255-1608.
Dec. 1-4: Western Cable Show, Anaheim, CA. Call (510) 429-5300.

WHEN IT COMES TO RETURN PATH MAINTENANCE

CAPTURE INGRESS

With the sheer multitasking power of the Guardian 9580 SST Return Path Analyzer, you'll capture and locate ingress events as short as 12.5 milliseconds on individual nodes or expand your monitoring configuration to any number of nodes by combining 9580 SSTs with 9580 TPX Test Point Expanders. Ingress ManageR PC Software runs the show, detecting and recording ingress outbreaks and monitoring alarms.

BALANCE AND HARDEN YOUR DISTRIBUTION SYSTEM

The advanced Guardian system puts more diagnostic muscle in the hands of your technicians. The battery powered Guardian SSR transmits reverse sweep signals to a 9580 SST in your headend, displays reverse sweep graphs and calculated values for GAIN and TILT pads, even shows you ingress spectrum graphs. All measurements are updated every 7/10 of a second, even with up to 6 SSR's accessing a single SST.

STOP INGRESS AT THE SOURCE

The Guardian RSVP Return Path Evaluator stops ingress where it starts: the subscriber's home. Up to 200 RSVPs can communicate with each Guardian 9580 SST in the headend to verify that the return path meets requirements. Working with a Guardian IsoMeter Reverse Leakage Detector, the RSVP verifies the shielding integrity of the home wiring, hardening your system against ingress with every installation and maintenance visit.

CALL NOW FOR A FREE WHITE PAPER

(800)344-2412

(317)895-3600 (317)895-3613 Fax

www.trilithic.com

TRILITHIC
The Engineering Guys

YOU CAN'T BEAT THE SYSTEM

GUARDIAN SYSTEM
Return Maintenance Technology

VENDOR CONNECTION

Vendor Connection is *Communications Technology*'s resource for up-to-date information on the industry's leading technology suppliers. These vendors have advertised in this issue. Check their ads for products and services that will improve your cable system's reliability, efficiency and capacity.

Alcoa Fujikura Ltd.
P.O. Box 3127
Spartanburg, SC 29304
(864) 433-0333; Fax: (864) 433-5560
Corie Fortune (864) 433-5409
fortun01@ssw.alcoa.com
Alcoa Fujikura Ltd. is the market leader manufacturing fiber optic cable for the telecommunications industry, providing products for fiber management systems. AFL also offers EF&I (engineer, furnish, install) services. Fujikura fusion splicers are also distributed.
Reader Service #64

Alpha Technologies
3767 Alpha Way
Bellingham, WA 98226
(360) 647-2360; Fax: (360) 671-4936
www.alpha.com
Baily Shewchuk
Alpha Technologies is a world leading manufacturer of application specific powering solutions for voice, video and data communication systems. Alpha's products include: UPS's, line conditioners, surge suppressors, batteries, and accessories.
Reader Service #3

Altec Industries, Inc.
210 Inverness Center Parkway,
Suite 130
Birmingham, AL 35242
(205) 991-7733; Fax: (205) 991-7747
www.Altec.com
Julie Walden
Altec Industries, Inc. features the Altec AP38 Aerial Cable Placer designed to place fiber and coaxial cable along with the Altec AT235FSB Telescopic Aerial Device mounted on a fiber splicing body.
Reader Service #58

AM Communications, Inc.
100 Commerce Blvd.
Quakertown, PA 18951-2237
(800) 248-9004; Fax: (215) 538-8779
www.amcomm.com
sales@amcomm.com
Bob Vogel (215) 538-8700
AM Communications is a leading supplier of monitoring systems for HFC transmission networks. AM's OmniStat product offers solutions for virtually every brand and kind of network equipment.
Reader Service #16

ANTEC Network Technologies
5720 Peachtree Parkway, N. W.
Norcross, GA 30092
(770) 441-0007; Fax: (770) 441-2460
www.antec.com
Brad Halverson
brad.halverson@antec.com
ANTEC Network Technologies, the Atlanta-based manufacturing division of ANTEC Corp., designs, manufacturers, distributes and markets a wide range of active transmission, powering, passives, and interconnection products for fiber optic coaxial and twisted pair networking, worldwide. ANTEC Corp., headquartered in Rolling Meadows, Ill., is an international communications technology company.
Reader Service #22

ASKA Communications Corporation
3540 NW 56th Street, Suite 206
Fort Lauderdale, FL 33309
(800) 840-6350; (508) 730-1065
Fax: (508) 677-2511
www.askacom.com
sales@askacom.com
Debbie Okamoto
ASKA Communication Corp. offers full range solutions with a variety of connectors, adaptors, splitters, tools for broadband drop applications, and other accessories. Whatever your needs ASKA has the solution.
Reader Service #56

Aurora Instruments, Inc.
1777 Blue Bell Parkway West
Blue Bell, PA 19422
(800) 510-6318; Fax: (215) 646-6318
Michael Bowman (800) 510-6318
Aurorasplr@aol.com
We manufacture and supply a complete line of fiber optic fusion splicers and accessories. Our splicers range from fully automatic, core-to-core machines to fixed V-groove.
Reader Service #19

Avantron Technologies Inc.
8596 Pix IX Blvd.
Montreal, Quebec H1Z 4G2
(800) 297-9726; Fax: (514) 725-5637
www.avantron.com
Rick Jaworski (317) 574-9557
info@avantron.com
Avantron manufactures test equipment for the cable TV Industry. With innovative low-cost high-quality products like the AT2000R Spectrum Analyzer, Avantron is making it possible for a large number of field technicians to have the tools they need to solve today's challenges.
Reader Service #59

BARCO
3240 Town Point Drive
Kennesaw, GA 30144
(770) 218-3200; Fax: (770) 218-3250
www.barco-usa.com
Earlene Bentley
ebbarco@aol.com
BARCO hardware and software improves the quality and reliability of signal delivery BARCO CATV equipment incorporates advanced capabilities to remotely monitor and control signal distribution system-wide, maximizing up-time and subscriber satisfaction.
Reader Service #54

Batteries Plus
625 Walnut Ridge
Hartland, WI 53029
369-0690; Fax: (414) 369-0680
www.batteriesplus.com
Dave Kreiner
batplus@batteriesplus.com
Batteries for standby, communications and technology. Battery chargers and test equipment, battery conditioning and testing. Batter rebuilding and custom battery assembly.
Reader Service #57

Belden Wire & Cable
P.O. Box 1480
Richmond, IN 47575-1980
(800) BELDEN-4; (765) 983-5294
www.belden.com
info@belden.email.com
John Hitch (765) 983-5238
Belden Wire & Cable Company, a subsidiary of Belden Inc., is a leader in the design, manufacture and marketing of specialty wire, cable and cord products for the electronics and electrical markets.
Reader Service #17

Blonder Tongue Laboratories, Inc.
One Jake Brown Road
Old Bridge, NJ 08857
(732) 679-4000; Fax: (732) 679-4353
www.blondertongue.com
cpalle@blondertongue.com
Emily Nikoo (732) 679-4000, Ext. 213
For over 40 years, Blonder Tongue Laboratories, Inc. has been manufacturing professional quality, commercial cable television products. Products include: Reception, Headend, Microwave, Analog & Digital Distribution, Fiber Optics, Interdiction, Test Equipment, Residential and Specialty Equipment.
Reader Service #29

Cable Innovations, Inc.
130 Stanley Court
Lawrenceville, GA 30245
(800) 952-5146; Fax: (770) 962-6133
www.cableinnovations.com
Nick Haralson
Haralson@rightmove.com
Cable Line, drop line, and power line surges suppressors. Including the CLPS-3009PI, DLPS-15D and PLS-125. And new from Cable Innovations the UHB-2001 Universal House Box.
Reader Service #30

Cheetah Technologies
6432 Parkland Drive
Sarasota, FL 34243
(941) 756-6000; Fax:(941) 758-3800
www.cheetahnet.com
Pamela Girardin (941) 756-6000,
ext. 1340
Pamela.girardin@cheetahnet.com
Through its internationally established Cheetah product line, Superior Electronics provides broadband status and performance monitoring solutions to world leaders in cable TV and telecommunications.
Reader Service #74

CommScope
P.O. Box 1729
Hickory, NC 28602
(800) 599-9265; Fax: (704) 459-5099
www.commscope.com
Gina Foy
Coaxial and Fiber Optic cables featuring New Power Feeder, Cable-in-Conduit, PIII, QR, and a complete line of drop cables including several available in EZ-PAK packaging.
Reader Service #35

ComSonics, Inc.
1350 Port Republic Road
Harrinsonburg, VA 22801

(800) 336-9681; Fax: (540) 432-9794
www.comsonics.com
Roy Weitzell (540) 434-5165, ext. 228
marketing@comsonics.com
ComSonics is a 100% employee owned manufacturer of cable TV field test equipment. We have a network of domestic sales people, sales reps and an international network consisting of 19 distributors.
Reader Service #34

CTC Joslyn

6049 Boat Rock Blvd.
Atlanta, GA 30336
(404) 346-3967; Fax: (404) 344-2611
alir@comtech.com
Ali Rickard (404) 346-3967, ext. 463
CTCJoslyn manufactures quality products for outside plant applications in the telecommunications industry. Our main product lines include: closures, terminals, tools, pole-line hardware, anchors, and encapsulants.
Reader Service #15

DX Communications

A Division of Itochu Cable Services, Inc.
1143 W. Newport Center Drive
Deerfield Beach, FL 33442
(888) 293-5856; Fax: (954) 427-9688
Ken Mosca
dxckm@aol.com
Manufacturer of quality headend equipment. Products include; digital satellite receivers, IRD's, agile modulators, satellite receivers, combiners, FM modulators, combiners, LNB's and accessories.
Reader Service # 20

Eagle Comtronics, Inc.

4562 Waterhouse Rd.
Clay, NY 13036
(315) 622-3402; Fax: (315) 622-3800
www.eaglefilters.com
Kris Wild
sales@eaglecomtronics.com
Eagle Comtronics is the worlds largest manufacturer of security traps, decoders tier traps and custom, OEM diplex filters.
Reader Service #23

FM Systems, Inc.

3877 S. Main St.
Santa Ana, CA 92707
(800) 235-6960
www.fmsystems-inc.com
Tom Corwin
Manufacturer of professional quality head-end, transmission, and test equipment for video and audio channels. Stereo RFM and TV processors, video and audio automatic level controls, subcarrier transmission systems, alarm and control systems.
Reader Service #13

FONS Corp.

71 Lyman St.
Northboro, MA 01532
(800) FONS-995; Fax: (508) 393-3657
www.fons.com
Alexandra Kiefer
akiefer@fons.com
FONS Corp. offers complete fiber optic management systems for datacom, telecom, and CATV applications. Products include enclosures, cable assemblies, connectors, attenuators, couplers and adapters.
Reader Service #68

FrontLine Communications

404 West Ironwood Drive
Salt Lake City, UT 84115
(801) 464-1600 (800) 231-1349
Fax: (801) 464-1699
www.frontlinecom.com
Bill Robertson
info@frontlinecom.com
FrontLine provides complete EAS systems covering IF, Baseband and the only patented, proven All Channel Message system available. Affordable for any size system with applications beyond EAS. We invite comparison!
Reader Service #62, 77

General Instrument Corp.

101 Tournament Drive
Horsham, PA 19044
(215) 323-1000; Fax: (215) 956-6497
www.gi.com
Geoff Roman, Sr. Vice President
General Instrument is the world leader in analog and digital systems that provide video, audio and high-speed Internet/data services over cable and satellite television networks.
Reader Service #25

Hewlett-Packard Company

Test and Measurement Organization
P.O. Box 50637
Palo Alto, CA 94303-9511
(800) 452-4844, ext. HPTV
Fax: (303) 754-4990
hp.com/go/catv
hpcatv@aol.com
Hewlett-Packard Company offers a comprehensive range of test equipment to keep your broadband system at peak performance -- from manufacturing through the headend and into plant maintenance.
Reader Service #14

Hopewell Precision

19 Ryan Drive
Hopewell Junction, NY 12533
(800) 221-2737; Fax: (914) 226-7285
Lloyd Albritton
Reader Service #21

KES (Klungness Electronic Supply)

P.O. Box 885
101 Merritt Ave.
Iron Mountain, MI 49801
(800) 338-9292; (906) 774-1755
Fax:(906) 774-6117
Greg Michaud (906) 774-6621, ext. 276
Distributes a full line of broad band products/delivers construction equipment, executive level stocking distributor/complete system integrator specializing in interdiction, data, Internet integration, CATV, load management distance learning/substation/distribution management.
Reader Service #36

Lindsay Electronics

50 Mary St. West
Lindsay, ON K9V 4S7
(705) 324-2196; Fax: (705) 324-5474
From USA: (800) 465-7046
www.lindsayelec.com
sales@hq.lindsayelec.com
David Atman
Focused on the last mile, our revolutionary new technology creates communication equipment to solve system problems before they become subscriber problems. This is achieved through applied ISO continuous improvement disciplines, innovation, and strict attention to details.
Reader Service #55

Main Line Equipment Inc.

837 Sandhill Avenue
Carson, CA 90746
(800) 444-2288; (310)-715 6518
Fax: 888-4-mainline; (310) 715-6675
www.mle.com
mainline@worldnetatt.net
Mark Lipp
Buy, sell and distribute, new, excess, and refurbished fiber optics, active electronics, converters, and passives. We manufacture a complete line of replacement pads, equalizers and plug-ins for most major manufacturers that meet or exceed original factory specifications.
Reader Service #37

Moore Diversified Products, Inc.

1441 Sunshine Lane
Lexington, KY 40505
(606) 299-6288; Fax: (606) 299-6653
www.MooreDP.com
mooredp.com
Gia Phelps and Bob DeMuth
Moore diversified Products, Inc. is a manufacturer of metal and plastic products that store, organize and protect fiber optic and coaxial cable in outside plant construction.
Reader Service #40

Multilink

580 Ternes Ave.
Elyria, OH 44035
(440) 366-6966; Fax: (440) 366-6802
www.multilinkinc.com/multilinkinc
mulink@ix.netcom.com
Steve Kaplan
Multilink is a leading manufacturer of cable television supplies. Multilink manufactures plastic enclosures, metal enclosures, and splice closures as well as fiber optic, and telecommunications products.
Reader Service #75

PDI-Electronics for Telecommunications

6353 West Rogers Circle #6
Boca Raton, FL 33487
(561) 998-0600; Fax: (561) 998-0608
www.pdi-eft.com
Johathan Edelman (561) 998-0600
PDI.Electronics@worldnet.att.net
PDI manufacturers and distributes every product that any type of cable system may need. From high tech headend products to passives and tools, PDI has it all.
Reader Service #10

Performance Power Technologies

P.O. Box 947
Roswell, GA 30077
(770) 475-3192; Fax: (770) 343-8492
Jud Williams
Batteries-Standby, Battery Chargers Test Equipment, Diagnostic Monitoring Systems, Power Conversion Products, Power Supply Products, Test Equipment. Power Supplies for Cable and Telecom featuring the "Magnum UPS" 90 volt 32 Amp HFC Centralized Node Powering System with "Smart/Gard" output protection.
Reader Service #27

Philips Broadband Networks

64 Perimeter Center East
Atlanta, GA 30346-6400
(770) 821-4136; Fax: (770) 821-2700
Contact: C. Murray
www.be.philips.com/pbn
Philips Broadband Networks, known for broadband RF and fiber-optic transport systems, is also a leader in advanced systems used to provide telephony and high-speed data services over your HFC video network. The company also supports wireless cable and digital video communication systems. Get connected with Philips - The Reliable Choice.
Reader Service #24

PROMAX

xventura@promax.es
Xavier Ventura
011-34-93-260-2002; Fax: 011-34-93-338-1126 (Spain)
US Distributor: NCS Industries
Harry Williams or Dick Grasso
(800) 523-2343
Manufactures test equipment and repair training systems for CATV and Satellite industries; consist of field strength meters (visual and digital), audio and TV test systems, digital multi-meters, oscilloscopes, logic analyzers, fraction generators, frequency counter, component measurement systems.
Reader Service #28

Radiant Communications

5001 Hadley Rd.
P.O. Box 867
South Plainfield, NJ 07080
(800) 969-3427; Fax:(908) 757-8666
www.Radcom.com
Radiant3@ix.netcom.com
Jean Harding (908) 757-7444
Manufacturer of fiber optic distance learning systems, baseband and broadband video/audio/data transmission systems, and high quality fiber optic components such as couplers, attenuators, adaptors, connectors and assemblies.
Reader Service #31

RELTEC

6221 N. O'Connor Blvd., Suite 105
Irving, TX 75039
(972) 501-3432; Fax: (800) 800-1280
www.relteccorp.com
Mark Wise (972) 501-3248
RELTEC is a leader in the design, manufacture and sale of a broad range of telecommunications systems, products and services to wireline and wireless service providers and OEMs around the globe in three categories: Access Systems, Integrated Wireless Solutions and Network Components and Services. RELTEC operates manufacturing plants in North America, Europe, Asia/Pacific and Latin America with over 5,250 employees worldwide.
Reader Service #50

Riser-Bond Instruments

5101 N. 57th St.
Lincoln, NE 68507
(800) 688-8377; Fax: (402) 466-0967
www.riserbond.com
John Ramus (402) 466-0933
jrasmus@riserbond.com
Riser-Bond Instruments is a leader in manufacturing TDRs with unique and exclusive features to quickly and easily locate and identify faults and conditions in any metallic two conductor cable.
Reader Service #73

Sadelco, Inc.

75 West Forest Ave.
Englewood, New Jersey 07631
(800) 569-6299; International:(201) 569-3323
Fax:(201) 569-6285
Mr. Leslie Kaplan, V.P.
www.sadelco.com
sadelco@aol.com
Designs and manufacturers signal level meters and calibrators.
Reader Service #69

Scientific-Atlanta

4261 Communications Drive
Box 6850
Norcross, Georgia 30091-6850
(800) 433-6222; Fax:(770) 236-7770
www.sciatl.com
Uwe Trode
Scientific-Atlanta is a leading supplier of broadband communications systems, satellite-based video voice and data communications networks and worldwide customer service and support.
Reader Service #1

Sencore Inc.

3200 Sencore Drive
Sioux Falls, SD 57107
(605) 339-0100; Fax:(605) 339-0317
www.sencore.com
Brad Johnson (605) 339-0100, ext.123
sales@sencore.com
Sencore will be exhibiting a full line of CATV and Wireless cable test instruments, including: MPEG-2 Transport Stream Analyzers, hand-held signal level meters designed for QAM digital signals, and video performance test instruments. Each unit is designed to meet all your system's analyzing and troubleshooting needs.
Reader Service #2

Siecor Corporation

489 Siecor Park
Hickory, NC 28603
(704) 327-5806
Robie Cline
Siecor, recognized as a telecommunications technology leader, specializes in optical fiber cable, interconnect hardware, termination and splice equipment, test equipment and training.
Reader Service #32

Silicon Valley Communications

931 Benecia Avenue
Sunnyvale, CA 94086
(408) 739-8800 Fax: (408) 245-9873
www.svci.com
sales@svci.com
Ed Feghali (408) 245-8800
Silicon Valley Communications, Inc. offers the most comprehensive line of optical transmission products including 1310 and 1550 nm transmitters, high performance optical amplifiers, indoor/outdoors receivers, and Network Management System.
Reader Service #51

Telecrafter Products

12687 W. Cedar
Lakewood, CO 80228
(800) 257-2448 Fax:(303) 986-1042
Ronnie Cox and Jim Marzano
mail@dropsupplies.com
Supplier of drop installation products for CATV, DBS, and wireless operators, including drop cable fastening products for single or dual cable, cable identification markers, residential enclosures, and more.
Reader Service #5, 7, 9

TeleWire Supply

94 Inverness Terrace East
Englewood, CO 80112
(1) 88-TELEWIRE; Fax: (303) 643-5797
www.telewiresupply.com
Mark Howard
TeleWire Supply, a division of ANTEC Corporation, is a leading international supplier of products needed to build and service a broadband communications network.
Reader Service #6

Toner Cable Equipment, Inc.

969 Horsham Road
Horsham, PA 19044
(215) 675-2053; (800) 523-5947
Fax:(215) 675-7543
www.tonercable.com
Info@tonrcable.com
Toner Cable Equipment, Inc. has 27 years of RF experience as a single source supplier of equipment to the television distribution industry, providing headends, satellite receivers, meters, modulators, taps, splitters, fiber optics and more.
Reader Service #44

Toshiba

9740 Irvine Blvd.
Irvine, CA 92618
(714) 461-4654 Fax: (714) 583-3597
www.internet.toshiba.com
webmaster@toshiba.com
Steve Rasmussen (714) 587-6631
Toshiba offers MCNS modems and MCNS gateway solutions, plant and market analysis, system design, installation and maintenance. Toshiba's systems are operating in 6 major markets actively servicing over 12,000 cable subscribers.
Reader Service #4

Trilithic Inc.

9202 East 33rd Street
(800) 344-2412 Fax:(317) 895-3613
www.trilith.com
Bob Jackson (317) 895-3600, ext. 152
bjackson@trilithic.com
Trilithic designs and manufacturers: Portable HFC test equipment; ingress monitoring systems; EAS compliance systems; RF and microwave components.
Reader Service #41, 43, 45, 71

Tulsat

1605 E. Iola
Broken Arrow, OK 74012
(800) 331-5997; Fax:(918) 251-1138
Mark Schumacher and David Chymiak
Tulsat is stocking distributor for Blonder Tongue, Drake and California Amplifier. 70,00 Square feet of complete repair facility and warehousing. Refurbished headend and line equipment, taps, traps, pin connectors and cable.
Reader Service #42, 70

Videotek, Inc.

243 Shoemaker Road
Pottstown, PA 19464
(800) 800-5719; (610) 327-2292
Fax: (610) 327-9295
David C. Hirsch
dchirsch@videotek.com
Located in Pottstown, Pennsylvania, Videotek, Inc., is a leading manufacturer of test and measurement equipment, video demodulators, routing and production switchers, color correctors and processors, and related equipment for the professional video and television broadcast markets. Videotek is committed to Zero Defects and is ISO-9001 certified.
Reader Service #49

Wavetek Corporation

5808 Churchman Bypass
Indianapolis, Indiana 46203
(317) 788-9351; Fax:(317) 782-4607
www.wavetek.com
Gary Culbertson
One of the top ten test measurement companies in the world, Wavetek Corporation designs, manufactures and markets worldwide a broad line of electronic test and measurement instruments for the cable television, telecommunications, wireless communications, radio, video, LAN, ATE and metrology markets. As the world leader in CATV test, Wavetek offers signal level, analysis, leakage and home wiring meters, sweep systems, headend monitoring, and bench sweep equipment.
Reader Service #8

TRAINING

By the NCTI

Troubleshooting Tap Problems, Part 2

This month's installment continues a series on troubleshooting tap problems. The material is adapted from a lesson in NCTI's Installer Technician Course. © NCTI.

Last month's installment listed some of the service-related problems found at a customer's tap and covered incorrect tap port levels. This month's discussion focuses on two more commonly experienced problems: a backward spliced tap and loose seizure screws.

Backward spliced tap

Figure 1 shows a 26/4-way tap spliced correctly and the normal tap input level, specified tap loss and desired tap port levels. RF signal levels more than 10 dB below design specifications at customer tap ports usually indicate that a tap was accidentally spliced in backward. This condition only affects the RF signal levels of the forward and return frequencies at the tap ports of that particular tap, because a tap's insertion loss is the same in either signal direction along the feeder line.

Figure 2 shows the same 26/4-way tap spliced in backward. The input signal level to the tap's output port is 41.5 dBmV at 450 MHz. The isolation between the tap's output port and the individual tap ports is 37 dB. To determine the signal level at each tap port, subtract the tap output port-to-tap port isolation from the output port signal level input. Compare the tap port levels in the two figures.

Loose seizure screws

The tap's seizure screws make the electrical contact between the tap's electronics and the connector's pin or the feeder cable's center conductor (if a feed-through connector is used). If either the input or output seizure screws are loose and making intermittent contact, the RF signal levels may fluctuate and cause flashing pictures. A loose seizure screw can also cause a decrease in RF signal levels and snowy pictures on channels 2-6. To correct the flashing problem or the signal level problem on the low-band, carefully tighten the loose seizure screw until it makes contact with the pin or center conductor. Then tighten the seizure screw one-eighth of a turn. Do not overtighten the seizure screw; this can weaken and break the connector's pin or the cable's center conductor.

Hands-on performance training

Proficiency objective: Identify a tap that has been spliced in backward or a tap with loose seizure screws.

Ensure that you have a sufficient number of SLMs, test TV sets and workstations for the number of students to practice troubleshooting on. Each workstation should have a live broadband signal feeding a tap. If possible, install different value taps with signal direction information removed in selected/all workstations and have students rotate among workstations.

Provide each student with a copy of the manufacturer specs for the taps used and your system specs for tap port signal levels at the highest and lowest available frequencies.

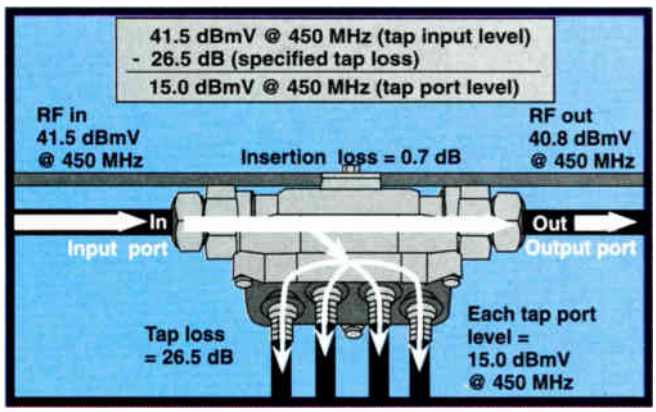
Demonstrate how to perform measurements at customer tap ports. Explain how to compare measurements to manufacturer and system specs to troubleshoot tap problems.

Demonstrate, with a test TV set, how loose seizure screws can produce flashing and verify signal levels with an SLM while alternately loosening and tightening tap seizure screws.

Have students practice troubleshooting backward spliced taps and taps with loose seizure screws.

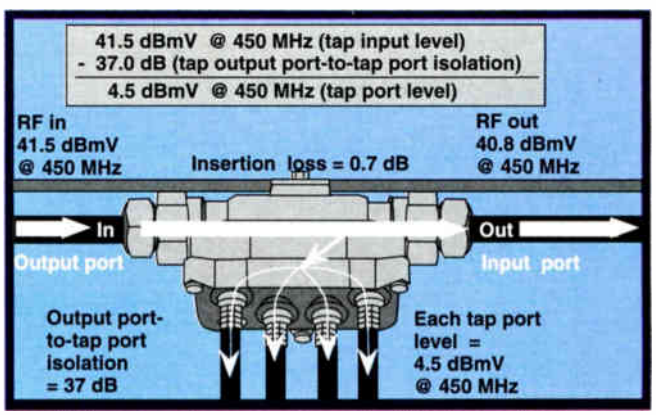
Verify that each student can successfully troubleshoot a tap to determine if it is spliced in backward or has loose seizure screws. CT

Figure 1



A 26/4-way tap spliced correctly

Figure 2



A 26/4-way tap spliced backward

RBI is turning the TDR world on its ear

Upper bandwidth problems? Riser-Bond Instruments can help!

Introducing the *NEW* Model 1205CX

Additional channels can push the upper bandwidth of your cable system. Minor faults can become major problems. Your system is not as forgiving as it used to be.

The Model 1205CX TDR features a new *sub-nanosecond pulse width* that helps uncover even the smallest imperfections in your cable. Model 1205CX will troubleshoot all lengths of trunk, distribution, and drop cables and help locate faults.

Let the Model 1205CX help turn your system around.

TDR technology from Riser-Bond Instruments. ***NO SMOKE, NO MIRRORS, NO WIZARDRY!***

Riser Bond INSTRUMENTS™

Telephone: 402-466-0933
E-mail: email@riserbond.com
Toll Free: 800-688-TDRs (8377)
Web site: http://www.riserbond.com

Reader Service Number 73

By Steve Johnson

Goodbye, But Not So Long

You probably noticed that there's a new face and a new name with the column this month. A new title for the column, too. Last month at the end of Cable Tec Expo, the Society of Cable Telecommunications Engineers lost its president, Bill Riker. No, we didn't misplace him, or even run him off. In fact, we wanted him to stay. Bill's been with the Society for more than 13 years, taking us from a shaky 1,000 members to 13,500 members currently. During that time, Cable-Tec Expo has grown to be the leading cable hardware show.

Bill left the Society to take a new position as vice president of technology for The National Cable Television Center and Museum. The bad news is that Bill is leaving the Society. The good news, for me at least, is that he and Anna are moving to Denver and will be my neighbors. And what is a loss to the Society is a gain for the industry and a great opportunity for Bill.

Bill will be a prime mover for the development of the Cable Center. His experience in overseeing the completion of SCTE's headquarters building in Exton, PA, will be good experience as he oversees the construction of a $15 million facility for the Cable Center.

Anna Riker still will be with the Society and will continue her role in putting together our national meetings as director of national conferences. The difference is that she will be working out of Denver, instead of Exton (when she's not traveling to check out convention facilities).

Being without a president definitely will cause a hiccup in the Society's operation, at least in the short term. Fortunately, we have a great national staff that can maintain the day-to-day operations and continue on-going programs.

Search committee

To expedite filling the president's position, we have established a search committee to review résumes and interview candidates. The Search Committee consists of John Vartanian of Viewer's Choice, Chairman; Dan Pike of Prime Cable; Rex Porter of *Communications Technology* magazine; Alex Best of Cox Communications; Bill Riker; and myself. We are fortunate to have Bill's help in the process; he can give us a lot of insight as to the job details. If you want to apply or to recommend someone, send a letter to: SCTE Search Committee, 140 Philips Road, Exton, PA 19341-1318 or send an e-mail to search.committee@scte.org.

Presidential qualifications

What qualifications should the new president have?

First of all, the successful candidate should be a strong leader to guide the SCTE into whatever lies in the future. As the cable industry converges with the computer industry and others, this individual will need to keep the SCTE in the forefront of where the industry is going, rather than in a position of trying to catch up.

The new president should have good people skills and will be called on to meet with other industry leaders, both technical and operational.

Marketing and sales skills will play a big role, too. A large part of the job is to sell the SCTE's benefits to middle and upper management. The SCTE's reputation is very high now within and outside the industry. The president will need to maintain and further this trend by keeping our accomplishments in front of the key players.

Lastly, technical knowledge and skills are important. The president must be able to converse fluently about the technical issues facing our industry today and in the future.

Another desirable trait would be previous experience running a small company. The SCTE is a small to mid-sized company, albeit with a slightly different product than most. Our three main products are listed on our masthead: "Training, Certification, Standards." The president will need to ensure that the Society's staff continually produces the best products available, in a volume and manner to generate sufficient revenue to continue the financial stability of our "company." Customer service is important, too.

Ideally, you'll see the face of the new president at the top of this column soon.

EAS

Those of you who know me are aware that the Emergency Alert System (EAS) has been one of my big projects over the last few years. The implementation date is now rapidly approaching. If your system (headend) serves 10,000 subscribers or more, are you ready for the Dec. 31, 1998, deadline? If not, why not buy the SCTE's new EAS Training Video? It has all the information you need on regulatory and technical requirements to prepare for purchase and installation of your system. Even if your system is smaller and not required to participate until 2002, order the video and start preparing now. Call the SCTE at (800) 542-5040 to order your copy today. CT

Steve Johnson is chairman of the board of the Society of Cable Telecommunications Engineers. His day job is director, engineering and technology, for Time Warner Cable. He can be e-mailed at steve.johnson@twcable.com.

IF INTEGRATING ELEMENTS AND CUSTOMIZING YOUR NETWORK MANAGEMENT SYSTEM TO YOUR BUSINESS PRACTICES IS FRUSTRATING, COMPOSE YOURSELF.

Finally, all the power you need to fine tune your network management system. Introducing ObjectArchitect™ and ExpertArchitect™. **ObjectArchitect** is a powerful software technology that cuts the time and cost of integrating network elements. **ExpertArchitect** is a flexible solution to mimic your business practices by adding intelligence to your network management system. And it's all brought to you with the professional services and customer support you need to make your network management easier to manage. Watch us perform.

Reader Service Number 74

For more information, please call us at (941) 756-6000

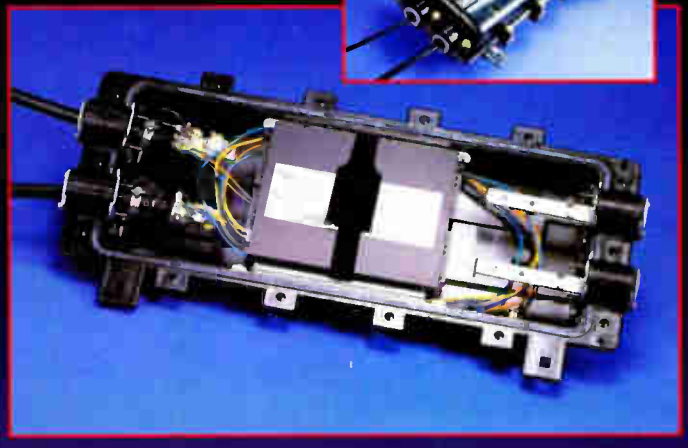
CHEETAH™ TECHNOLOGIES

The #1 Source

For Fiber Optic Storage And Management Systems

The ***2116-SAPTB ADJUSTABLE SNO-SHOE™*** designed to store slack at 90 degree locations.

STARFIGHTER-3000-F SPLICE CASE, developed to handle large fiber counts.



FIBER DISTRIBUTION UNITS (FDU) for Premise Wiring. Full line of cabinets and rack mount units. Customizing to fit your needs.

The ***NODE CABINET*** that can handle your fiber slack storage and broadband telecommunication needs, all in one.

TM

Multilink

Engineered to Make the Difference

580 Ternes Avenue P.O. Box 955, Elyria, OH 44035

Phone (216)366-6966 **FAX** (216)366-6802
area code subject to change June 1, 1997 to (440).

Internet: **http**://www.multilinkinc.com/multilinkinc
E-mail: MuLink@ix.netcom.com

24 Hour Voice Messaging Worldwide Distribution