COMMUNICATIONS TECHNOLOGY

Official trade journal of the Society of Cable Television Engineers

COMPRESSION

When is more . . . . . .less?

And less, more?

May 1992

ALPHA WORKS...
AND WORKS...
AND WORKS...

Alpha has become the world-wide leader in cable power for one simple reason—*Alpha works.*

Reliability.
Alpha gained its reputation and status as world leader by building reliable standby power. Even though we have introduced dozens of major power innovations, we're proud to say our most important innovation is restoring meaning to the word reliability in cable power.

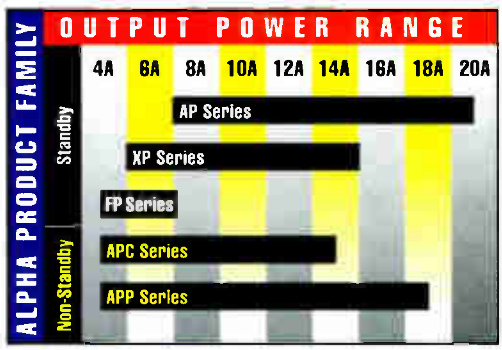
Alpha's AM Power Module is the work-horse of cable power with a record of reliability unmatched in the industry.

Functionality.
Alpha has stayed ahead of the cable power curve by introducing major innovations in cable power such as software controlled status monitoring, the Amp Clamp lightning-strike surge suppressor, temperature compensated battery charging, and much more.

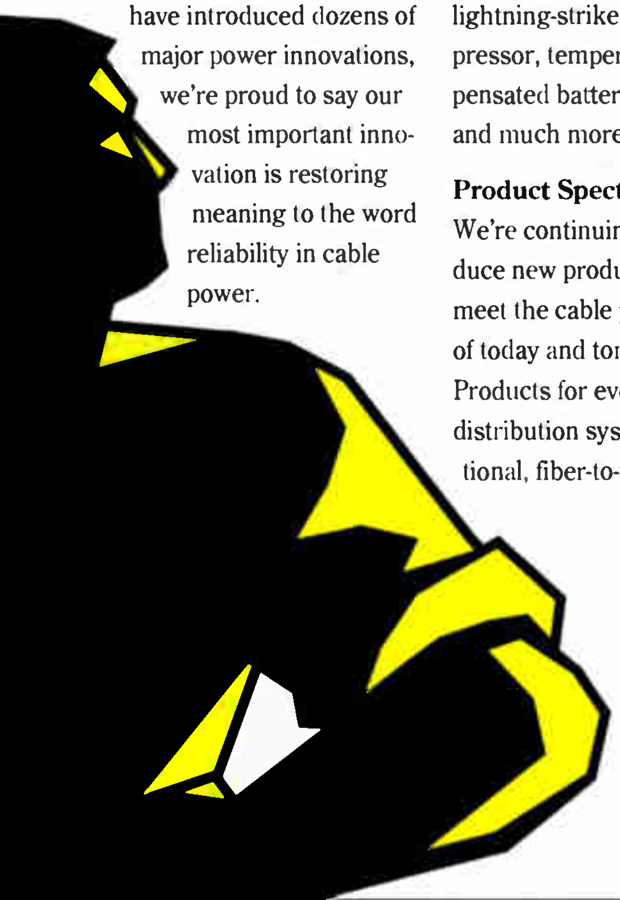
Product Spectrum.
We're continuing to introduce new products to help meet the cable power needs of today and tomorrow. Products for every type of distribution system—traditional, fiber-to-the-feeder, or hybrid. And products that keep all your vital equipment running including office computers and telephones, pay-per-view systems, and head-end signal processing equipment.

Alpha. The Company That Works for You.
Alpha's customer support is based on the idea that your problem is our problem. Take batteries for example. When we found that our customers were receiving batteries from aged warehouse stock, we made arrangements to provide batteries direct from the manufacturer. The result: maximum service life. It's one little thing, but it shows we're committed to backing you up.

Alpha Works.
Alpha works to provide reliable power products, designed to do more for you than you ever thought, and to solve more power problems than you knew existed. Alpha works, because the people of Alpha are committed to backing you up completely.



Alpha's family of products provides a full range of reliable power systems ranging in output from 4 Amps to 20 Amps.



Alpha Technologies—
3767 Alpha Way, Bellingham, WA 98225
Tel: (206) 647-2360 FAX: (206) 671-4936
5700 Sidley Street, Burnaby, B.C. V5J 5E5
Tel: (604) 430-1476 FAX: (604) 430-8908
Sales offices also in Germany, England and the Middle East.

ALPHA TECHNOLOGIES

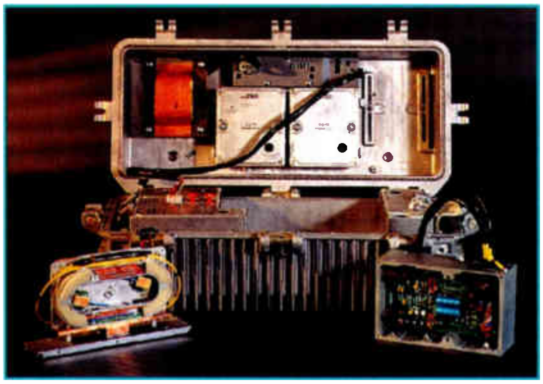
We're Here to Back You Up™

Reader Service Number 2

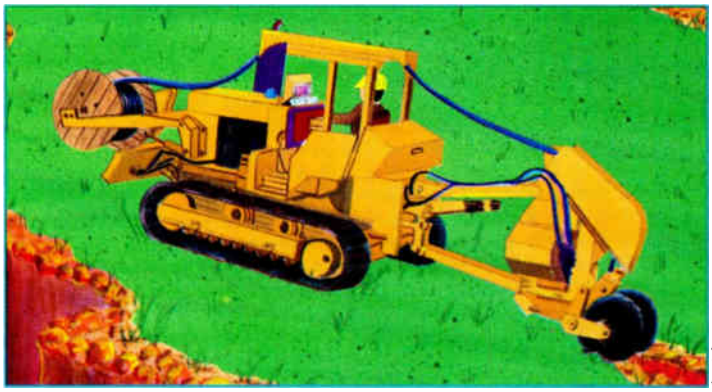
See us at the Cable-Tec Expo Booth #302/304


Trilogy Introduces
M.V.P.
Drop Cable Created For The Most Valuable Performance
The hallmark of excellence in drop cable is teamwork, driven by technical achievement! This results in cable worthy of the name MVP! Quality drop cable that performs outstandingly, day in and day out, under the toughest conditions. MVP Drop Cable sets new industry standards for all its competitors to try to meet. This Trilogy challenge is your gain! Yes, Trilogy technology now brings you a new quality star in drop cable to meet your most demanding communication needs.
Nothing escapes Trilogy's advanced approach – from expert selection of raw materials to rapid delivery of its finished product.
For the Most Valuable Performance, insist on Trilogy. The Quality Driven Drop Cable!
QUALITY
TECHNOLOGY
SERVICE
Trilogy
COMMUNICATIONS INC.
Call or write for free sample and brochure:
Trilogy Communications, Inc., 2910 Highway 80 East, Pearl, Mississippi 39208.
800/874-5649 601/932-4461
Reader Service Number 3

Departments

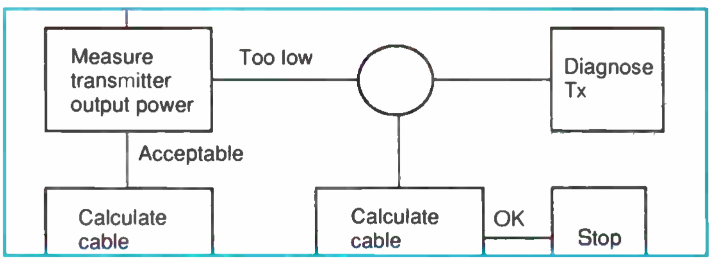


Correspondent's Report 86



Geri Saye

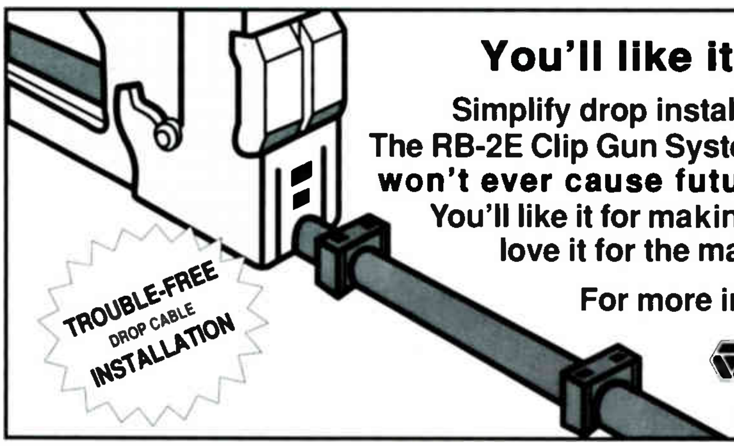
Back to Basics 59



FO troubleshooting 30

Features

©1992 by Communications Technology Publications Corp., a subsidiary of Transmedia Partners I-L.P. All rights reserved. *Communications Technology*™ (ISSN 0884-2272) is published monthly by Communications Technology Publications Corp., 50 S. Steele St., Suite 500, Denver, Colo. 80209, (303) 355-2101. May 1992, Volume 9, Number 3. Office of publication is 50 S. Steele St., Suite 500, Denver, Colo. 80209. Second-class postage paid at Denver, Colo., and additional mailing offices. POSTMASTER: Send address changes to *Communications Technology*, 50 S.Steele St., Suite 500, Denver, Colo. 80209.



You'll like it today – and love it forever

Simplify drop installations today, and stop cable damage forever. The RB-2E Clip Gun System won't contribute to signal degradation and won't ever cause future trouble calls.

You'll like it for making the drop installation efficient. And, you'll love it for the many years of trouble-free drops.

For more information on RB-2E call 800-548-7243.

Telecrafter Products

Products creatively designed for the cable industry

Reader Service Number 4

ONI OPTICAL NETWORKS INTERNATIONAL

Optical Network News

The following highlights are from Optical Networks International's quarterly newsletter.

■ ONI's new architecture extends fiber's reach

ONI has developed a new fiber architecture designed to cost-effectively drive fiber deeper into cable systems. The Star-Star-Bus-500 (SSB-500) is a migratory architecture that enables operators to build cable plant today serving 500 homes per node at cost parity with FTF systems serving 2500 homes per node. The SSB-500 positions cable systems for introduction of new services with extensive interactive requirements.

(Visit ONI's Booth #1614 and see related story in the May, 1992 issue of *CED*)

■ AT&T to stage digital compression theater

AT&T will be unveiling its NTSC digital compression system at the May NCTA show in Dallas, with a demonstration in AT&T's new digital compression theater. AT&T's digital compression system was first announced to CableLabs in a response to their RFP on digital compression.

(Visit the AT&T Theater at Booth #1623.)

■ Alternate Access and Digital Transmission presentations at NCTA

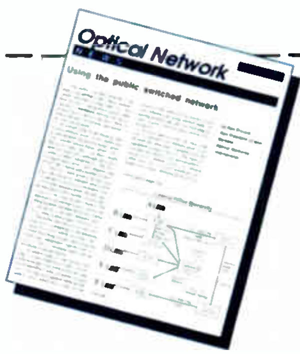
Be sure to mark your show calendar for these important technical sessions:

Monday, May 4	3:15 p.m.	*Technical Implications of Alternate Access* Andy Paff, ONI
Wednesday, May 6	9:00 a.m.	*Digital Transmission Fundamentals for Cable Engineers* Ed Callahan, ANTEC (Carl McGrath, AT&T, co-author)

■ ONI demos new automated fusion splicer

ONI will be demonstrating the new Type-35SE fusion splicer from Sumitomo at the May NCTA show. This latest version of fusion splicers reduces splicing time and provides newly automated functions which ensure quality splices every time. The Type-35SE features an enhanced user interface, automatic atmospheric arc compensation, electrode monitoring and self-diagnostics.

(See a demonstration in ONI's Booth #1614)



To receive your free subscription to ***Optical Network News*** please complete and mail this coupon to: ONI, 8101 East Prentice Avenue, Englewood, CO 80111, or FAX it to ONI at: 303-694-0127.

Name ______________________________

Title ______________________________

Company ___________________________

Address ____________________________

City _______________ State ____ Zip ______

Phone ( ) __________________________

AT&T Technology Integrator

ONI OPTICAL NETWORKS™ INTERNATIONAL

1•800•FIBER•ME

©1992 ANTEC 5/92

See us at the NCTA Show, Booth #1614. Reader Service Number 5

Reader Service Number 6

THE BEAST™ STOPS THIEVES.

Stop The Thieves And You'll Stop Signal Leakage In MDU's.

Theft means signal leaks. It's as simple as that. And wherever you've got MDU's, you've got a high probability of theft.

But if you install The Beast™ high security apartment box with our exclusive SuperLock, you turn thieves and vandals into revenue generating subscribers. You also cut down on your CLI compliance problems. And you save on future maintenance and truck rolls.

No wonder you'll find The Beast working for almost every major MSO and in almost every major city.

To find out how to put The Beast to work for your system, call Cable Security today. We're the industry's number one source for high security installations.

Cable Security
801 Fox Trail
P.O. Box 2796
Opelika, AL 36801
800-288-1506

EDITOR'S LETTER

PAC attack

According to a recent edition of Denver's *Rocky Mountain News*, the CATV industry has contributed over $2 million to government officials during the last seven years through a vehicle known as political action committees (PACs). I hadn't given much though to the PAC process since a number of years ago when some of us in "key" positions in a corporate office were solicited to support the process. While the pressure to contribute was subtle, my decline to do so was equally subtle.

I personally do not believe in PACs, since I feel they are nothing more than an attempt to buy influence. Call me old-fashioned or even idealistic, but I think our elected representatives should be voting the will of the public, not the desires of special interests and lobbyists. Granted, some will say the cable industry's PACs are necessary to ensure that cable legislation remains generally favorable, or maintain "access" to those in Washington.

Nonsense. Since when should we have to pay to maintain access to our elected officials? As for unfavorable cable legislation (read "re-regulation"), who do we have to blame but ourselves for this one? First of all, had our rates and quality of service managed to stay in line after deregulation, we probably wouldn't have unfavorable legislation to worry about. Second, our industry was regulated for a lot longer than it has been deregulated and I seem to recall rather rapid growth during that time.

But back to PACs. Our industry's $2 million since 1985 represents a pretty small piece of the PAC process. According to the *News* article, PACs contributed more than $160 million to congressional candidates in 1990 alone. During the seven-year period mentioned in the article, telco PACs gave a little over $9 million, and TV/radio PACs lined up with just under $1 million.

It's interesting that the subject of PAC money should come up during an election year, especially a year that has already seen a lot of problems with the House bank scandal and other financial controversies. This whole mess has shown that money tends to drive way too much of our national policy.

"Some will say the cable industry's PACs are necessary to ensure that cable legislation remains generally favorable, or to maintain 'access' to those in Washington. Nonsense."

I haven't been too keen on our national politics for a long time. I lodged my own miniprotest years ago by not registering with any political party. My voter registration reads "unaffiliated," but yes, I do exercise my right to vote (except in election primaries, where unaffiliated voters are not allowed to vote). I'm one of those radicals who supports term limitations, too. I say, let's do away with career politicians.

For that matter, we now have the technology to put the vote on almost everything — including proposed legislation — directly in the hands of the general public. When our founding fathers created the system we have today, the public didn't have telephone, radio, television, CATV or personal computers. I get tired of the argument that we elect our officials to vote on our behalf. When was the last time your congressman asked you how he or she should vote on a particular issue? No, it's the lobbyists and special interest groups — including PACs — who determine the outcome of most legislation, not you and me.

Ronald J. Hranac
Senior Technical Editor

Power by Design

Standby Power Supplies Engineered for Today's Cable TV Networks

Small Simple Standbys™ from Power Guard will save you money, short and long term.

Since SSS™ is available in 3-6-9-12 or 15 amp ratings and in two or three battery configurations, you can maximize efficiency and reduce your power bills and battery costs by choosing the right model for each power supply location. If your power requirements change - simply upgrade the power module. Small Simple Standbys™ will grow with you.

And because our studies have shown that most power supply locations actually use less than 9 amps of power - we strongly recommend that you consider our 24 volt units for those locations. You get an immediate 33% savings in battery costs and still have up to four hours of standby run time.

Small Simple Standby™ - The right product at the right time for the right price. No wonder we continue to be the fastest growing power supply company in Cable TV.

Reader Service Number 7

1-800-288-1507

POWER GUARD

FAX 205-742-0058

Available Nationwide from Anixter Cable TV

Reader Service Number 7

PFM ELECTRONICS, INC.
RT. 3 BOX 301 C • NEW BOSTON, TX 75570
1-800-235-2288 FAX: 903-628-5074

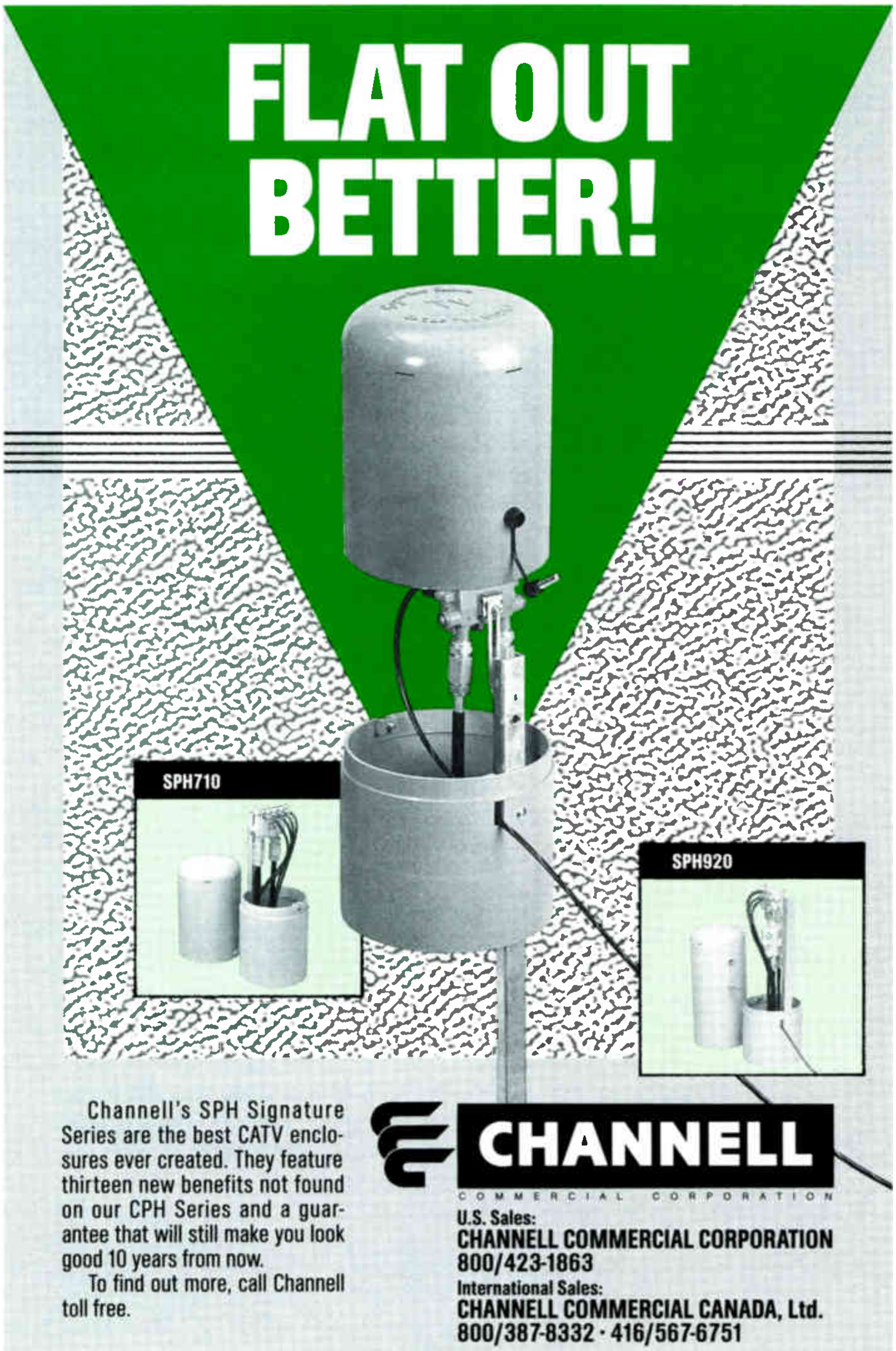
CATV Repair of Headend and Line Equipment

PFM Electronics, Inc has established a reputation of high-quality repair capabilities with an average turn-around time of five to ten working days.

Sustaining Member of the SCTE

OLSON TECHNOLOGY INCORPORATED

PFM Electronics is a distributor of Olson Technology Inc. headend equipment.



Reader Service Number 8

COMMUNICATIONS TECHNOLOGY
A Transmedia Publication

Vice President-Editorial, Toni I. Barnett
Executive Editor, Wayne H. Lasley
Associate Editors, Shelley L. Bolin
Laura K. Hamilton
Senior Technical Editor, Ronald J. Hranac
Contributing Editor, Patrick J. Gushman
East Coast Correspondent, Lawrence W. Lockwood

President/Group Publisher, Paul R. Levine
Vice President-Sales, Charles M. Castellani
Account Executives, Barbara Bellomo
Mike Elmer
Patricia Linster
Bill Parker
Linda Sommer
Production/Traffic Manager, Mary Felker
Art Director, Brad Hamilton

CT Publications Corp.
A subsidiary of Transmedia Partners-I, L.P.
50 S. Steele St., Suite 500, Denver, Colo. 80209
(303) 355-2101 FAX (303) 355-2144

Transmedia Partners-I, L.P.
Chairman, Terrence Elkes
Managing Director, Harry C. Gerhart
Executive Vice President, Paul R. Levine
Controller, Kenneth W. Edwards Jr.
Assistant to Controller, Sharon Hamilton
Advertising Coordinator, Maria Sullivan
Circulation Manager, Mary Sharkey
Sales Support Manager, Paula Turner
Administrative Assistant, Maureen McDonald

Advisory Board
Paul Barth, United Artists
Austin Coryell, Mile Hi Cablevision
Richard Covell, Texscan
Len Ecker, The Len Ecker Corp.
James Farmer, Scientific-Atlanta
Robert Luff, Scientific-Atlanta
Tom Osterman, Alpha Technologies Inc.
Dan Pike, Prime Cable
William Riker, Society of Cable Television Engineers
Clifford Schrock, CableBus Systems Corp.
Michael Smith, Adelphia Cable
A.H. Sonnenschein, Consultant
Raleigh B. Stelle III, Philips Broadband Networks
David L. Willis, CATV Consultant
Doug Wolfe, Corning Inc.

SCTE Board of Directors
At-Large Directors
Richard Covell, Texscan
Tom Elliot, TCI/CableLabs
Wendell Bailey, NCTA
Regional Directors
Tom Elliott (Region 1), Catel Telecommunications
Ron Hranac (Region 2), Coaxial International
Ted Chesley (Region 3), Rock Associates Inc.
Leslie Read (Region 4), Sammons Communications
Wendell Woody (Region 5), Anixter Cable TV
Rich Henkemeyer (Region 6), Paragon Cable
Victor Gates (Region 7), Metrovision
Jack Trower (Region 8), WEHCO Video Inc.
James Farmer (Region 9), Scientific-Atlanta
Michael Smith (Region 10), Adelphia Cable
Diana Riley (Region 11), Jerry Conn Associates
Walt Ciciora (Region 12), ATC

SCTE BPA

IN SUDBURY.

QR® WORKED WHEN OTHERS FAILED.

Multiple splices like these were all too common before Northern Cable began installing Quantum Reach.

Because of the weather extremes in Sudbury, Ontario, any kind of regular coaxial cable may last only months before some type of failure occurs. The weather, in fact, can be blamed for a 15-year history of unimaginable cable repair and replacement costs for Sudbury headquartered MSO, Northern Cable Services. It was a cable line technician's worst nightmare.

In 1984, all that changed for Northern Cable when they turned to our Quantum Reach. With an already established impressive performance record, QR promised better days ahead. And that's exactly what happened. The continuous cycle of splicing and replacement ended with the first installed section of QR.

Today, Northern Cable credits Quantum Reach with reducing their maintenance time by 75% and they tell us that their "construction guys just love it". They know that every new mile of QR installed is one less mile to worry about come next year, or the year after that, or the year after that, or the...

The point here is simple. If Quantum Reach will do the job for Northern Cable under the worst conditions when every other cable failed, think what it could mean for your system. We even have a comprehensive article detailing the QR installation in Sudbury. It's free for the asking. Simply contact your nearest Comm/Scope representative or call us at (800) 982-1708 or (704) 324-2200.

Comm/Scope, Inc.
THE Cable in Cable TV.

Comm/Scope, Inc., P.O. Box 1729, Hickory, NC 28602.
Phone (800) 982-1708 or (704) 324-2200.
Fax: (704) 328-3400.

Reader Service Number 10

National Show technical agenda

DALLAS — The National Cable Television Association's show is being held here from May 3-6. The following is a listing of the times and specific locations of tech sessions, seminars and meetings to be held in the convention center.

• *Monday, May 4* tech sessions: "HDTV/ATV — The big picture" (12-1:15 p.m., West Ballroom A); "Optimizing fiber technology for cable" (12-1:15 p.m., West Ballroom B); "Advances in fiber technology" (1:30-2:45 p.m., West Ballroom A); "Flexible network architectures — Safeguarding cable's future" (3:15-4:30 p.m., West Ballroom A).

As well, the NCTA Engineering Committee Signal Leakage Subcommittee meeting will be held on Monday from 4:30-6 p.m. in Room N217.

• *Tuesday, May 5* tech sessions: "Digital techniques and applications — audio and data" (10:30-11:45 a.m., West Ballroom A); "Improving the cable-consumer electronics interface — Issues and hardware" (12-1:30 p.m., West Ballroom A); "Real-world solutions to outage problems" (12-1:30 p.m., West Ballroom B); "Winning papers from signal security competition" (12-1:30 p.m., West Ballroom C); "Digital systems techniques and performance" (2:30-3:45 p.m., West Ballroom A); "Meet the FCC staff" (2:30-3:45 p.m., West Ballroom D); "High-speed digital transmission for CATV" (4:15-5:30 p.m., West Ballroom A).

• *Wednesday, May 6* tech sessions: "Cable systems or networks — What are you building?" (9-10:15 a.m., West Ballroom A); "The new technical standards: A sharper image" (9-10:15 a.m., West Ballroom B); "Advances in conditional access and consumer electronics capability" (10:30 a.m.-12 p.m., West Ballroom A); "Headend operations" (10:30 a.m.-12 p.m., West Ballroom B).

Also, two tech seminars will be held 3-4:30 p.m. on Wednesday in the Lower North Meeting Rooms: "Basic introduction to digital applications" and "Implementation of the new technical standards."

HDTV: One demoed, one being tested

WASHINGTON, D.C. — General Instrument's DigiCipher and partner Massachusetts Institute of Technology recently conducted the "world's first" all-digital transmission over-the-air and via cable for lawmakers, the FCC and the press.

At local public station WETA, a digital HDTV video recorder rolled at the transmitter site, the signal went out over normal bandwidth, and the broadcast was received, decoded and displayed on HDTV monitors located in the U.S. Capitol connected to off-air antennas and Congress' cable system. Meanwhile, District Cablevision also picked up, monitored and evaluated the transmission.

In Alexandria, Va., Zenith Electronics and AT&T's all-digital HDTV system, Digital Spectrum Compatible HDTV, is being tested at the Advanced Television Test Center. It is the third of five HDTV systems to undergo the battery of tests. →

WHY ARE THESE GUYS SO HAPPY ABOUT FIBER OPTICS?

THEY JUST SAW 3M FIBER PRODUCTS

Multilink™
ENGINEERED TO MAKE THE DIFFERENCE
P.O. Box 955, Elyria, Ohio 44035
Office & Plant (216) 324-4941, Fax # (216) 324-4947
Toll Free Nationwide 1-800-678-4510

CALL US FOR MORE INFORMATION
(216) 324-4941

Innovation working for you™
3M
Worldwide Sponsor 1992 Olympic Games

See us at the SCTE Show, Booth 652-654. Reader Service Number 11

Performance That Eclipses All Others.

Look up to DX for the highest level of quality. reliability and performance under the sun.

Now with VideoCipher® II Plus, the new DIR-647 features advanced IRD technology delivering the finest CATV broadcast quality pictures possible.

For a closer look contact your DX representative today at DX Communications, Inc., 10 Skyline Drive, Hawthorne, NY. 10532 or call (914) 347-4040.

DX ANTENNA

See us at the NCTA Show, Booth #1245. Reader Service Number 12

CableLabs files complaint to ATSC

WASHINGTON, D.C. — Cable Television Laboratories' general counsel filed a letter of grievance to the Advanced Television Systems Committee, which has a subgroup for creating a voluntary standard for a ghost-cancellation reference signal.

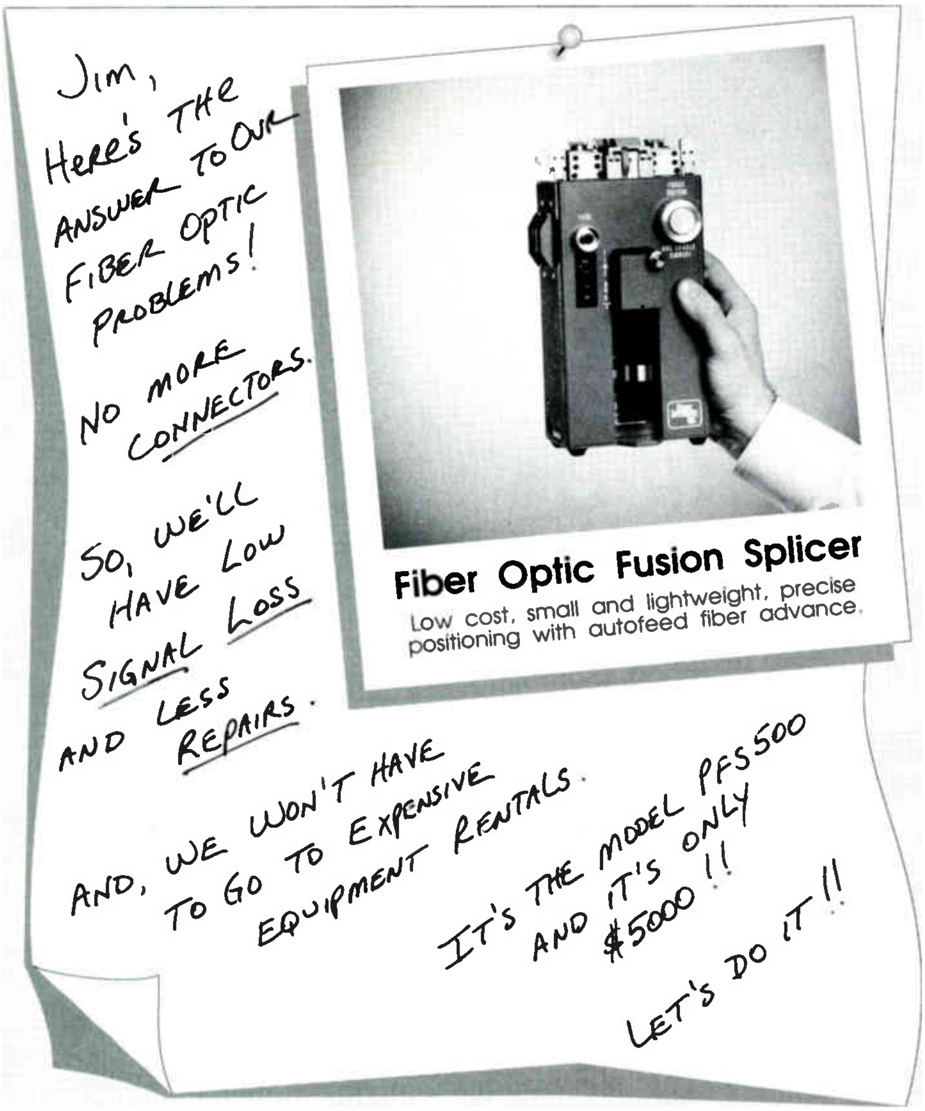
The complaint concerns the editing of the six-page report CableLabs submitted to the ATSC highlighting the Labs' view of the ghost-cancelling test procedure and test results. According to the letter, the ATSC edited CableLabs' submission "without the authorization of CableLabs, and in spite of its direct objection." The letter goes on to say "the editing done distorts the intent and meaning of CableLabs' report."

Galaxy V launches

LOS ANGELES — Eight days following its March 13 launch, Galaxy V, Hughes Communications' next-generation cable-dedicated satellite, was successfully deployed in geosynchronous orbit. Galaxy V's final birth is at 125° WL. As well, Hughes' Westar V satellite was set to end service on May 1 and subsequently be retired. (For a list of the programmers set to occupy Galaxy V along with a wall chart of the latest data on U.S. C-band birds, see last month's issue of *CT*, page 45.)

In other Hughes news, the company contracted with Thomson Consumer Electronics and News Datacom to provide the transmission system, encryption system and initial consumer receiving units for its DirecTv entertainment distribution system. According to Hughes, the system will be capable of providing over 100 channels to 18-inch antennas installed at consumers' homes across the country in 1994.

Fusion Splicing



Power Technology Incorporated

Address correspondence to: Box 191117 Little Rock, Arkansas 72219-1117 501-568-1995
Plant location: 7925 Mabelvale Cutoff Mabelvale, Arkansas 72103 Fax 501-568-1994

Reader Service Number 13

TCI/McCaw do PCS trial

ASHLAND, Ore. — TCI and McCaw Cellular began a market trial of a residential microcellular service here. The trial, promoted as the Ashland Personal Telephone Service, is said to be the first in the country to sell a combined residential/local wireless service to the public.

The test is set to last six months and 200 area residents are participating. They will be able to make and receive calls to and from anywhere in the greater Ashland community.

Magnavox changes name

MANLIUS, N.Y. — Magnavox CATV Systems changed its name to Philips Broadband Networks Inc. as of April 6. The change was said to reflect "enhanced commitment from its parent company, Philips N.V." (Magnavox CATV has been a division of Philips since 1974.) The Magnavox name, however, will not become a CATV label of the past; PBN's distribution products will continue to bear the Magnavox moniker.

Pico sues over patent infringement

LAKEVIEW TERRACE, Calif. — Pico Products announced it's suing Northeast Filter Co. for breach of contract and patent infringement. Pico says Northeast's license under Pico's patent to make and sell certain encoding and positive trapping devices had been terminated for failure to pay royalties. As well, a license agreement under the same patent with Arrow Communications Labs has been terminated. Eagle Comtronics and Production Products are still authorized to use Pico's patent.

If Communications Systems Were This Simple, Any Cable Would Do.

COMMERCIAL GRADE TIGHT BUFFERED LAN FIBER OPTIC CABLES

	Operating Temperature Range	Core-Locked ™ Jacket	Indoor Use	Indoor/ Outdoor Use	Fungus Resistant	Sunlight Resistant	Breakout Riser Cables Maximum Fibers	Distribution Riser Cables Maximum Fibers	Breakout Plenum Cables Maximum Fibers	Distribution Plenum Cables Maximum Fibers	Custom Manufactured Product Delivery
AT&T	-20°C to +70°C		▼				0	36	0	12	10–12 weeks
SIECOR	-20°C to +70°C		▼	▼	▼		50	144	36	24	3–4 weeks
OPTICAL CABLE CORPORATION	-40°C to +85°C	▼	▼	▼	▼	▼	108	144	102	48	2–3 weeks
COMPANY X	-20°C to +80°C		▼				?	?	?	?	?
COMPANY Y	-20°C to +65°C		▼				?	?	?	?	?
COMPANY Z	-10°C to +50°C		▼				?	?	?	?	?

OPTICAL CABLE CORPORATION

P.O. Box 11967 • Roanoke, VA 24022-1967
PHONE (703)265-0690 • TELEX 705-290 • FAX (703)265-0724

Reader Service Number 14

Society elects new board members

EXTON, Pa. — March 28, 1992, marked the official closing of the Society of Cable Television Engineers' annual election to fill empty seats on its 1992-93 board of directors. The results of this year's election are as follows:

At-Large: Tom Elliot, Tele-Communications Inc., representing the entire United States
Region 3: Norrie Bush, Columbia Cable, representing Alaska, Idaho, Montana, Oregon and Washington
Region 4: Wayne Hall, Warner Cable, representing Oklahoma and Texas
Region 5: Mark Wilson, Multimedia, representing Illinois, Iowa, Kansas, Missouri and Nebraska
Region 7: Terry Bush, Trilithic Inc., representing Indiana, Michigan and Ohio
Region 8: Jack Trower, WEHCO Video, representing Alabama, Arkansas, Louisiana, Mississippi and Tennessee
Region 10: Mike Smith, Adelphia Cable, representing Kentucky, North Carolina, Virginia and West Virginia
Region 12: Walt Ciciora, Ph.D., American Television & Communications, representing Connecticut, Massachusetts, Maine, New Hampshire, New York, Rhode Island and Vermont

They will join the following seven SCTE board members currently serving their 1991-1993 terms:

At-Large: Wendell Bailey, National Cable Television Association, representing the entire United States
At-Large: Richard Covell, Texscan, representing the entire United States
Region 1: Tom Elliott, Catel, representing California, Hawaii and Nevada
Region 2: Ron Hranac, Coaxial International, representing Arizona, Colorado, New Mexico, Utah and Wyoming
Region 6: Rich Henkemeyer, Paragon Cable, representing Minnesota, North Dakota, South Dakota and Wisconsin
Region 9: Jim Farmer, Scientific-Atlanta, representing Florida, Georgia and South Carolina
Region 11: Diana Riley, Jerry Conn Associates, representing Delaware, Maryland, New Jersey and Pennsylvania

In addition, the referendum vote proposed by the board of directors to change the titles of the Society's officers passed.

Fake ballots caught in election

EXTON, Pa. — Unfortunately, a problem was recently detected with this year's Society of Cable Television Engineers election. DLS Accounting Services, the accounting firm retained by the board since 1987 to tabulate national elections, discovered fraudulent ballots among the legitimate votes using a security process initiated several years ago by SCTE national headquarters.

After consultation with SCTE's attorney, DLS began working with paper experts at the print shop that produced the election package to carefully examine each ballot in order to purge the election of invalid votes. This separation was accurately accomplished by comparing the differences in ink density,

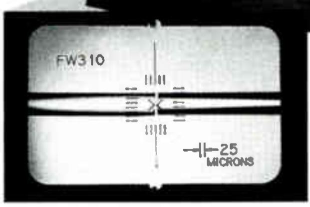
NICE SPLICE!

Orionics/Aurora FW-310 *automatic* fiber optic fusion splicers...

The new connection for field proven, reliable, low loss splices — anywhere!

Aurora Instruments now builds, sells, and supports the popular Orionics FW-310, the advanced fusion splicer from the originators of fusion splicing technology. ***Consider these outstanding advantages:***

- Negligible light loss— <0.028 dB average
- One-button operation aligns, gaps, fuses
- Programmable for up to 20 fiber profiles
- Portable, rugged carrying case with three power sources — rechargeable NiCads, 120 VAC and 12 VDC
- Satisfaction guaranteed service/support program includes training, warranty, repairs, technical/applications assistance



Convenient, easy to view 45X display provides a bright, sharp view of the fibers during the splicing process

Contact us today for full technical details.

ORIONICS
AURORA INSTRUMENTS, INC.
Dublin Hall, Suite 402 • 1777 Sentry Parkway West • Blue Bell, PA 19422
Telephone: (215) 646-4636 • Fax: (215) 646-4721

Reader Service Number 48

Display Systems International Inc.

Character Generators (information channels)

Advertising Systems (with image capture)

Visit us at the NCTA show Booth # 1410

Canadian Office:
203 Mallin Cres., Saskatoon, Sask, Canada S7K 7W8
Ph:(306) 934-6884 Fx:(306) 934-6447

US Office:
147 West Main Street, Dayton, PA, USA 16222
Ph:(814) 257-8210 Fx:(814) 257-8633

Reader Service Number 49

T.K.O.

Knock echoes clean out of your system!

Until now, cable operators had to fight with the positioning of their antennas and delay lines to stop echoes from impairing their customer's television reception. The VECTOR™ Video Echo Canceler from Philips Broadband Networks changes that by knocking out even complex echo artifacts from off-air channels quickly, economically and reliably.

Based on a revolutionary new technology and manufactured in the USA by Philips Broadband Networks, VECTOR utilizes a unique "Ghost Cancelation Reference" (GCR) signal. Declared the clear winner and undisputed champion in recent field tests conducted by the NAB, the Philips GCR took on the challenge to clean up ghosted signals better than all contenders.

With up to seventy-five percent of TV viewers currently experiencing some degree of ghosting, VECTOR is destined to become a heavyweight champion of picture quality improvment in your headend. It operates automatically, continuously and spectacularly allowing you to provide your subscribers with much higher quality, ghost-free signals.

So, if you've been hit by customers complaining of ghosting, strike back! Ask your Philips Broadband Networks representative about our newest Technical Knock Out . . .

. . . The VECTOR Video Echo Canceler.

For more information contact:

Philips Broadband Networks, Inc.
(formerly Magnavox CATV Systems)
100 Fairgrounds Drive, Manlius, NY 13104
Ph: (315) 682-9105, Fax: (315) 682-9006
Call 1-800-448-5171 (in NY State 1-800-522-7464)

Test image with two multipath distortion echoes

Test image with echo cancellation

Philips Broadband Networks, Inc.

PHILIPS

PHILIPS

Reader Service Number 16

print quality and raw paper stock. As a result, DLS and the print shop provided SCTE's board of directors at its March 23 meeting with written testimony of their evaluation process, which resulted in a calculated accuracy exceeding 99 percent.

Upon carefully reviewing the testimony and also establishing that all individual elections were decided by differences outside this possible margin of error, the board voted to certify the election. (All candidates currently on the board abstained from the vote.) It was only then that the preliminary standings of the candidates running in the election were announced. The board then voted unanimously to conduct further investigations to identify the individual(s) responsible. It also directed the national headquarters staff to increase security measures in order to maintain the integrity of future elections.

The board then called a meeting on April 7 to discuss further action regarding the invalid ballots cast during the election. The board voted to offer amnesty from legal prosecution to the individual(s) responsible should that individual(s) come forward and contact the Society before April 27, 1992.

If the perpetrator(s) was to come forward, that individual(s)'s name would not be made public by SCTE, no criminal prosecution would be initiated by the Society and the individual(s) would be dealt with in accordance with the Society's national bylaws.

The board then voted unanimously to conduct a full investigation into the election fraud if the person(s) responsible did not come forward by April 27. If the responsible individual(s) is identified as a result of the investigation, SCTE will prosecute to the fullest extent of the law and shall seek restitution for all costs of private investigators, document experts, legal counsel and other related expenses.

During the meeting, the board also created an Ad-Hoc Oversight Subcommittee comprised of both board and non-board members to act as observers during the investigative process in order to ensure a fair and impartial investigation.

Newly elected directors will officially take their seats at the next SCTE board meeting, scheduled to be held Saturday, June 13, prior to Cable-Tec Expo '92 in San Antonio, Texas.

Technology Update '92 to be held in New York

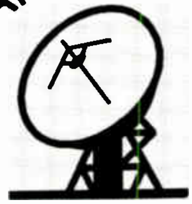
LAKE GEORGE, N.Y. — The Society of Cable Television Engineers, along with the New York State Commission on Cable Television, is sponsoring Technology Update '92 — the 18th annual northeast technical seminar and trade show — here from May 18-20.

Included will be a wide variety of technical sessions. Sessions are as follows:

- "How to establish in-house installer training" with Ralph Haimowitz, SCTE
- "Secrets of digital band compression" with Walt Ciciora, American Television & Communications
- "Consumer service through service call reduction" with Joe Van Loan, Cablevision Industries
- "New technical standards" with Wendell Bailey, National Cable Television Association
- "Beyond AM fiber" with John Holobinko, American Lightwave
- "Overview of digital applications" with Tom Staniec, NewChannels Corp.
- "A practical approach to fiber design" with Joe Selvage, Adelphia Communications

For more information on attending the show, contact Al Richards at (518) 474-1324.

Reader Service Number 17

Satellite Antennas

SPECTRUM
800-628-0088

Down Converters

Multi-Sat Feeds

Look at F1, G1, C4 & G5 with one antenna!!!

CALL or return this card for details...

LNAs LNBs LNCs

Power Dividers

CT 5/92

NaCom

Building Communication Systems Throughout America

• Engineering • Installations • Design • Construction
• Fiber Optics • DBS

For More Information
CALL 1-800-669-8765 or RETURN THIS CARD
SEE YOU AT BOOTH #426 at the SCTE SHOW!

Name ______________________________
Company ______________________________
Address ______________________________
City/State/Zip ______________ Phone/FAX ______________

CT 5/92

MEMBERSHIP APPLICATION

Make check payable to SCTE.
Mail To:
SCTE®
SCTE
669 Exton Commons
Exton, PA 19341

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

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

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

APPLYING FOR: ☐ INDIVIDUAL @ $40 SUSTAINING @ $250

Please print or type information. Data will be used exactly as it is submitted here.

☐ MR. ☐ MRS. ☐ MS. TITLE: ______________

NAME: ______________ (First Initial Last) TEL. #: ______________ (Area Code-Number)

EMPLOYER: ______________ (Company Name) FAX #: ______________ (Area Code-Number)

CO. ADDRESS: ______________ (Street/PO City State Zip)

USE HOME ADDRESS? ______________ (Street/PO City State Zip)

YOUR SIGNATURE: ______________ DATE: ______________

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

NAME ON CARD: ______________ EXP.: ______________

MASTERCARD NO.: ______________

VISA NO.: ______________

SIGNATURE FOR CHARGE AUTHORITY: ______________

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

☐ I am also an SCTE Installer Member. My Member Number is # ______________.

*** SPONSORING CHAPTER OR MEETING GROUP: ______________ ***

CT 5/92

Name ____________________
Title ____________________
Company ____________________
Address ____________________
City, State, ZIP ____________________
Phone ____________________
FAX ____________________

Place
Stamp
Here

SPECTRUM
803 Forest Ridge
Suite 108
Bedford, TX 76022

Name ____________________
Company ____________________
Address ____________________
City, State, Zip ____________________
Phone ____________________

Place
Stamp
Here

NaCom
1900 E. Dublin-Granville Rd.
Suite 100A
Columbus OH 43229

Place
Stamp
Here

SCTE®

SCTE
669 Exton Commons
Exton, PA 19341

DOUBLE BOX PEDESTALS:

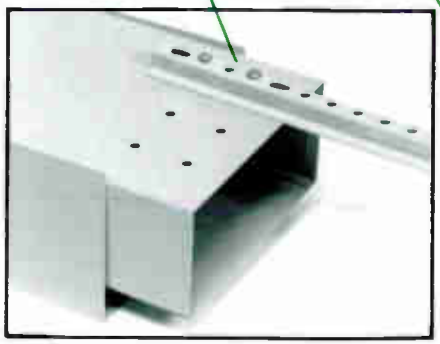
The TOM-PED is a hybrid between an apartment box-in-a-box and a pedestal. This concept offers two levels of high security against illegal hook-ups.

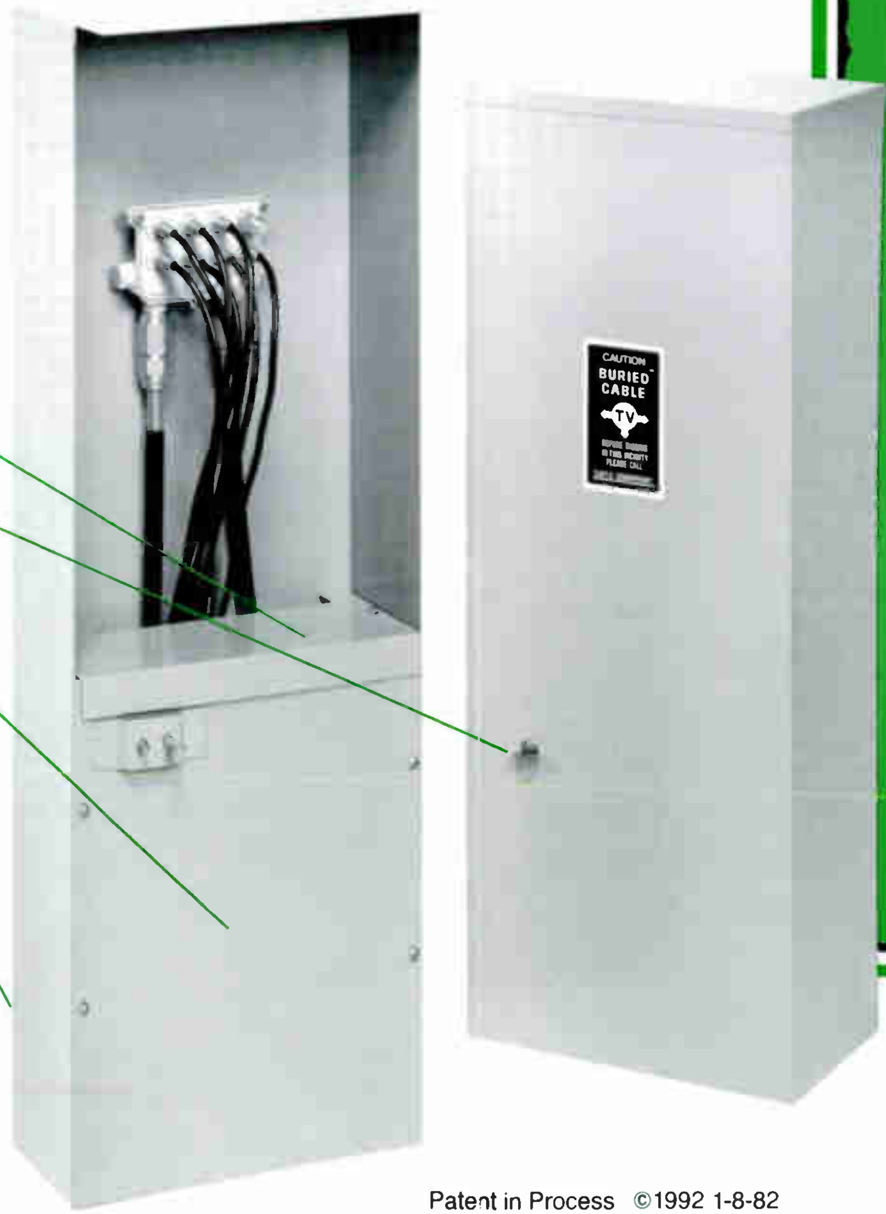
STOP ILLEGALS:

In the unlikely case the cover is forced off, you have still stopped an illegal hook-up because all of the unconnected drops are still hidden and protected in the inner lower box.

FEATURES:

- Lower box opens on top for drop and trap access by the installer.
- TOM-PED can be keyed to any manufacturing locking system.
- Front lower panel opens for access to feeder cable, mounting ped stake and installation of TOM-PED to the wall.
- Stamp in bury line tells you how deep to bury the TOM-PED.
- Single or double mounting stake holes.

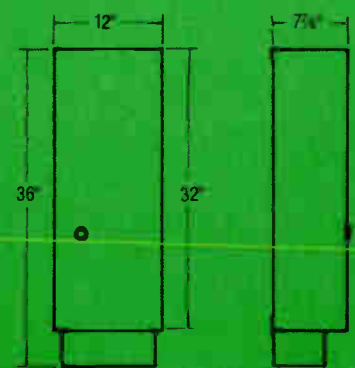




Patent in Process ©1992 1-8-82

- 100% spot welded construction for greater durability and quality control of welds.
- 16 Gauge Galvanealed Steel. Inland Steel Alloy Paint Title, A A 40.
- UL listed surface has a gray matte finish to which paint bonds well, both chemically and mechanically.
- Holds paint better to surface because it is textured steel.
- UL 50 Standard Outdoor Box Rating.
- Gray baked-on polyester powder coating. UL Approved (# MH5701(N)).
- Scratch Test/Salt Spray Test.
- ASTM Rating.

PART #	DESCRIPTION	PACKAGE
RTP-1834	TOM-PED WITH LOCK AND TAMPER SCREWS COMPLETE	2
BH-1012	#10 X ½" BUTTON HEAD SCREW, TAMPER PROOF	100 PCS
BHHK	5/32 T/R HEX KEY	1
BHTG-5	5/32 BUTTON PIN HEAD DRIVER AND BIT	1
BHL	CATV UNDERGROUND BURIED CABLE	25/CTN
BS-24	24" PED STAKE	10/CTN
BS-52	32" PED STAKE	10/CTN
BSL	STOCK LOCK	10/CTN



Multilink TM

ENGINEERED TO MAKE THE DIFFERENCE

P.O. Box 955, Elyria, OH 44035
Office & Plant (216) 324-4941
Fax# (216) 324-4947

Tom Ped™

DOUBLE BOX PEDESTAL

Super High Security Against Illegals

For use at apartment buildings and mobile home parks for taps and interdiction top housings where super high security is needed.

Multilink™

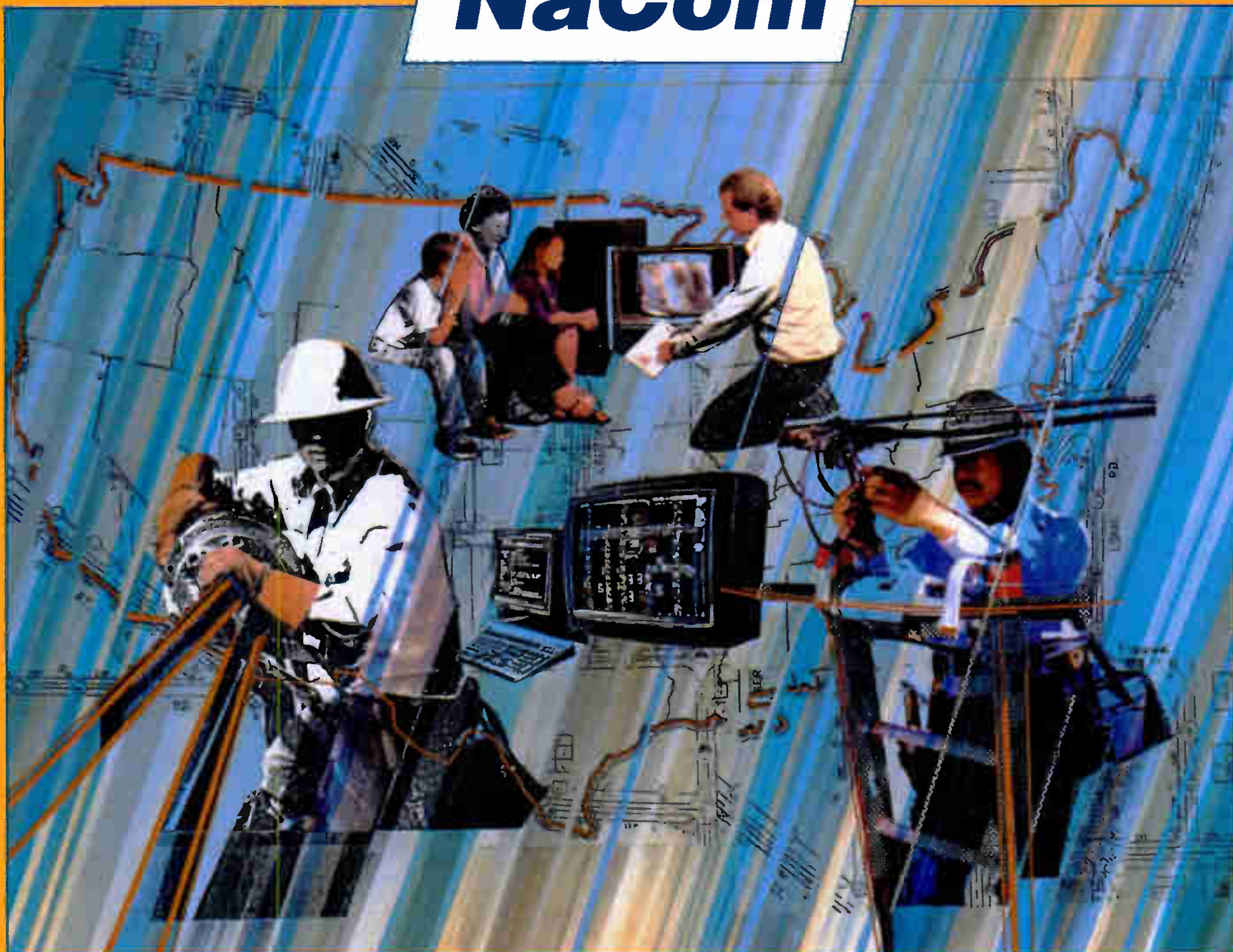
ENGINEERED TO MAKE THE DIFFERENCE

Multilink™

Multilink Inc.
Communication Division
P.O. Box 955
Elyria, Ohio 44035
(216) 324-4941
FAX: (216) 324-4947

TO:

NaCom



Construction
Design/Drafting
DBS
Fiber
Installation
Engineering

Call NaCom for ALL your FIBER needs!

- Fiber Pre-Testing, End-to-End Testing
- Fiber Route Engineering
- Fiber Activation
- Fiber to Feeder Design/Drafting
- Fiber Construction
- Fiber Splicing

NaCom

1900 E. Dublin-Granville Rd. • Columbus, Ohio 43229 • 800-669-8765

Reader Service Number 42

Compression and its impact on cable

By Vito Brugliera
Vice President of Marketing & Product Planning
Zenith Cable Products Division
Zenith Electronics Corp.

A convergence of technological and marketing forces is resulting in a dramatic change of the cable TV business. The number of programmers is steadily increasing the choices available to operators and subscribers. This expansion of choice, the growth of the videocassette rental market and the lengthened release window for films available to cable has reduced the growth of premium pay services.

As a consequence, the premium pay services are experimenting with different approaches. One of these is multiplexing, or running the same repertoire of movies on several channels. The number of movies in the library is the same. Near-video-on-demand (NVOD) pay-per-view (PPV) will give subscribers more options and variety in viewing a movie.

As all of this has been happening, technology has been steadily advancing. Cable plant is being extended beyond typical 350 MHz and 450 MHz bandwidths, with some systems to 1 GHz. Channel availability is being extended as programming options increase.

Transponder shortage

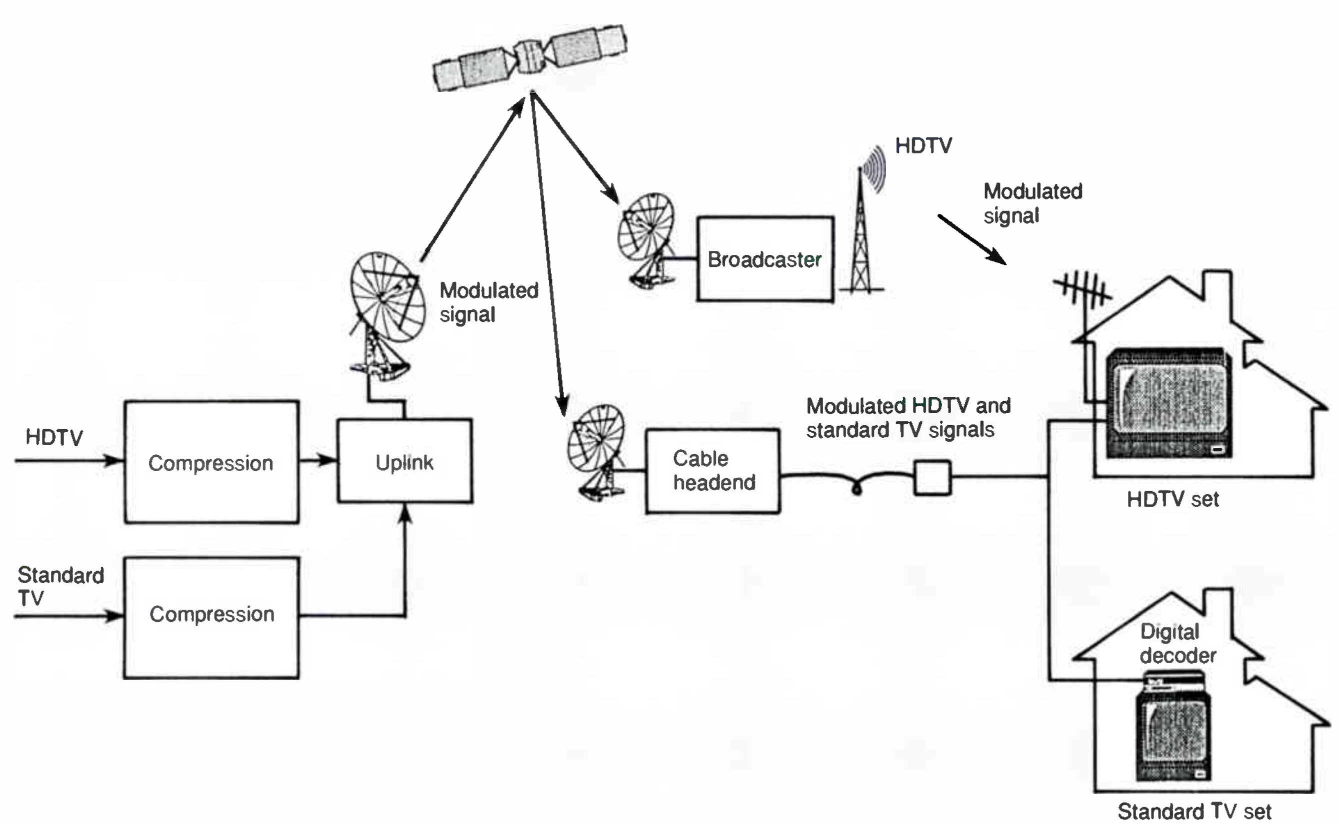
One portion of the cable distribution infrastructure has not kept pace. Satellite transmission facilities have lagged behind cable plant and programming expansion. A potential scarcity of satellite transponder capacity is developing.

Technology advances will alleviate this developing transponder shortage. The effort to develop a terrestrial high definition TV (HDTV) broadcast standard has advanced digital compression technology, making it possible to compress multiple NTSC TV programs into the 6 MHz occupied by a conventional NTSC signal. CableLabs, in conjunction with a major operator and programmer, has issued a request for proposal for satellite transmission equipment to compress satellite-delivered signals. It is anticipated that within a year, equipment will be available for compression of satellite-delivered NTSC signals.

Digital video compression technology offers an alternative to bandwidth extension of cable plants, which usually implies a plant rebuild. Digital technology requires less signal power and by operating compressed signals at the upper end of the cable plant spectrum, it will be possible to extend the viable bandwidth of the plant to regions unusable for conventional NTSC signals. As a result:

- Signal bandwidth is extended electronically.
- Compressed signals are concen-

End-to-end video transmission system



trated at one end of the signal bandwidth.

- Conventional plant operation remains for the prior bandwidth.
- A new tier of services becomes available to subscribers.
- Only these subscribers receive decoders for decompressing signals.
- Even more bandwidth and channels are available by physically rebuilding the plant.

What we have now is a seamless expansion path for new services the additional channel capacity provides. The unanswered question is: "Is there enough business and revenue to justify the cost?" The next year will provide an answer as new services such as NVOD are tested.

Comparison of modulation approaches

	4-VSB	16-QAM	32-QAM	64-QAM
Data				
Number of data levels	4	4	6	8
Theoretical relative data rate	1*	1	1.25	1.5
Ruggedness				
Functions in all existing cable plants	Yes	Yes	No	No
Adds channels in bandwidth roll-off region	Yes	Yes	No	No
Continuous wave interference rejection	Excellent	Good	Moderate	Poor
Phase-noise rejection	Excellent	Good	Poor	Poor
Forward error correction	Yes	Yes	Yes	Yes
Required C/N (without error protection)	22 dB	22 dB	25 dB	28 dB
Analog friendliness				
Coexistence with analog signals	Excellent	Good	Poor	Poor
Composite triple beat rejection filter	Yes	No	No	No
Signal acquisition with noise/interference	Excellent	Good	Fair	Fair
Channel equalizer	Yes	Yes	Yes	Yes
Cost				
Manufacturing complexity	Lowest	Low	Moderate	High
Cost of receiving equipment	Lowest	Low	Moderate	High

*Although, theoretically, all four-level approaches have the same relative data rate, the 4-VSB system uses a 21.5 megabit-per-second channel bit rate — greater than any announced four-level 6 MHz digital data transmission system.

This technological opportunity is not just limited to cable. Terrestrial services such as MMDS and over-the-air broadcasters also could avail themselves of the technology and, as a result of the extended channel capacity, become more viable competitors.

Another class of competition will come from direct broadcast satellite (DBS) services. The technology was originally developed for satellite transmission and all that is required is a subscriber terminal instead of a headend terminal.

Another catalyst for additional channel capacity will be the diffusion of HDTV services from terrestrial, satellite and cable programmers. The FCC has placed a time window within which deployment of HDTV transmission is required or the terrestrial broadcaster will lose its additional channel. Under the most stringent must-carry scenario, cable operators will be required to carry these additional HDTV channels, thereby reducing their channel capacity for existing services.

Advantage of choice

Cable's most salient advantage from a subscriber's point of view has been choice. Compression will allow satellite services expanded channel capacity and increase options for choice. This will diminish the differentiation between cable and satellite. An effective way for cable to maintain a competitive edge is to increase channel capacity and choice of services.

The need for increased channel capacity already is evident with multiplexing by programmers. Programmers will be among the first to adopt HDTV signal formats as a competitive element in their marketing strategies. Programmers offering HDTV will not be costly to cable operators because: 1) there will be minimal capital outlays, 2) HDTV programming offers a competitive advantage, and 3) additional channel capacity is available in the roll-off portion of the cable spectrum and by using NTSC compressed signals elsewhere.

This will increase the need for additional channel capacity. As the addressable universe grows and revenues from PPV increase, additional channels will be needed for NVOD services.

Consumer friendliness

Another opportunity digital video signal compression offers the cable and consumer electronics industries is the creation of a truly user-friendly product along with a host of new services for subscribers.

NTSC signal transmissions will be with us for several decades because there are almost 170 million NTSC receivers in consumer homes and they will continue to be sold for decades. HDTV receivers will be dual receivers, capable of receiving and displaying both HDTV and NTSC signals. A set-top terminal will be required to decode NTSC compressed signals for subscriber use on NTSC-only receivers.

There are two aspects to HDTV or NTSC compressed signals: transmission and compression. There are several different transmission modulation approaches for the proposed HDTV broadcast standard. The accompanying table compares various modulation techniques. It is quite conceivable, and in fact desirable, that a common transmission method be usable with both NTSC compressed and HDTV signals.

A modulation method known as 4-VSB can be used to transmit both HDTV and NTSC compressed signals. An advantage of the 4-VSB transmission system is its ruggedness. Cable plants with a marginal signal-to-noise ratio (36 dB) will have difficulty using 32/64 QAM transmission systems in the roll-off portions of their cable plant because the QAM systems are less rugged. The 4-VSB transmission system delivers digital information to the TV receiver decoder. The digital data packets can represent either a compressed HDTV signal or multiple NTSC compressed signals. The receiver will recognize which type of signal is present and convey the digital data to the HDTV decoder or a plug-in compressed NTSC decoder. This plug-in decoder would be provided by the cable oper-

(Continued on page 40)

Performance of digital modulation methods

The following is used with permission of the National Cable Television Association. It is adapted from a paper that ran in the "1991 NCTA Technical Papers."

This article provides a brief overview of digital modulation techniques and the important parameters used in quantifying them, and discusses the major types of channel impairments and their effect on the signal as well as the effects of real (non-ideal) demodulator's performance. The specific modulation methods, QPSK, QPR, 16-QAM, and 4-VSB AM, modeled in this article are discussed. A description is provided of the simulation technique as well as the channel model it simulates. A model for a "typical" cable channel is discussed along with the performance variation that may be "typical" for a consumer-grade demodulator. Simulation results for this model are presented and discussed.

By Leo Montreuil
Staff Engineer
And William Wall
Principal Scientist
Scientific-Atlanta

Recently introduced new digital audio services and the promise of highly compressed digital video in the near future instigated this study of digital modulation methods for cable applications. Digital modulation offers many potential advantages over analog transmission such as better transmission power, more services in a given bandwidth, essentially perfect noise-free reproduction of the original source when above some threshold carrier-to-noise ratio (C/N), and unbreakable signal security. In order to utilize these potential advantages, a modulation method must be selected that provides reliable reception in a cable environment, a data rate appropriate for the service and economical demodulation in the subscriber's home.

While numerous theoretical analyses of digital modulation performance exist in the literature listed at the end of this article, a practical comparison under signal conditions typical of cable systems was not found. Further, a method for simulating specific channel conditions and measuring performance for a variety of modulation techniques with those specific channel conditions was desired. To that end, a computer simulation has been developed that accurately models digital modulation/demodulation methods in the time domain, adds a variety of controlled impairments and measures the resultant bit error rate. This simulation technique has been found to be highly accurate and greatly reduces the time to test system design changes as well as test competing modulation methods.

Methods of digital transmission

As a brief review, digital transmission is accomplished by modulating an RF carrier to a discrete value (or state)

Figure 2a: QPSK in-phase eye pattern, alpha = 20%

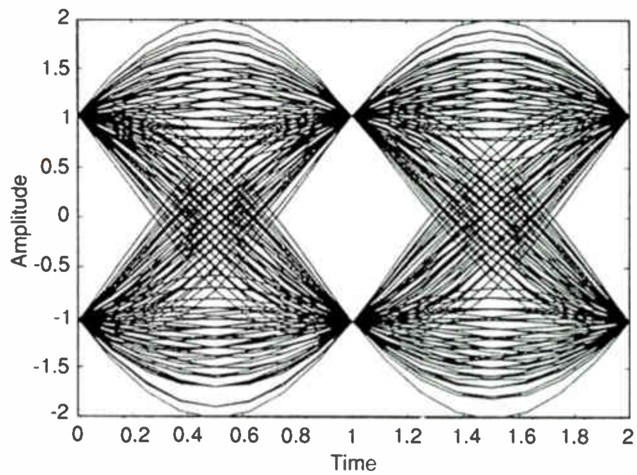


Figure 1: 16-QAM anphase eye pattern, alpha = 20%

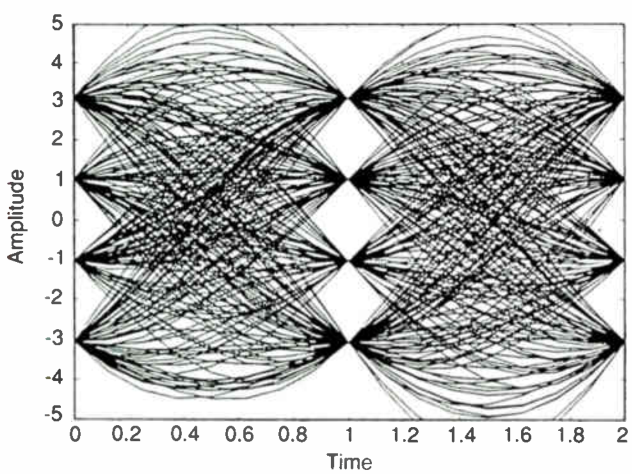
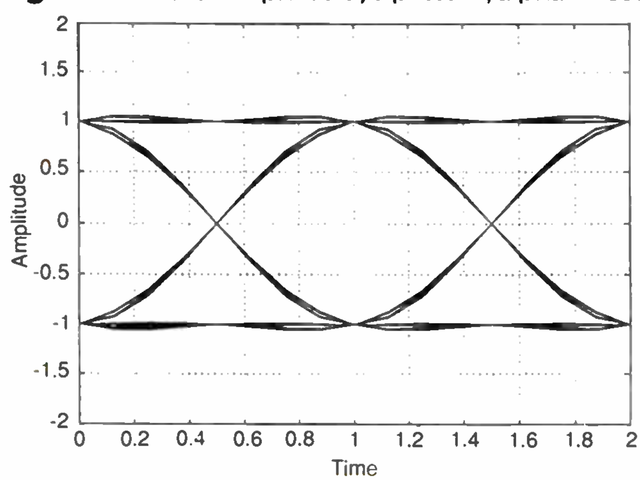


Figure 2b: QPSK in-phase eye pattern, alpha = 100%



Only The FS74A Allows You To See The Picture, Hear The Audio, Plus Measure The Critical Levels, Ratios, Hum And Noise In Just Seconds . . .

How can you ensure your customers are receiving the absolute best signal? Sencore recommends the following 1, 2, 3 Go-No-Go testing!

1 Sencore's New FS74A Channelizer Sr. allows you to measure signals all the way from the headend to the subscriber's tap, automatically and without any interpretations. Simply connect the signal and digitally tune through the channels in your system. You'll quickly read the video and audio levels of each and every channel from 5 to 890 MHz.

2 With the FS74A, hum and S/N tests are simple and error free. Simply tune to any RF channel, switch the function selector to either HUM or S/N and read the meter. There is no faster or more accurate method. (patented)

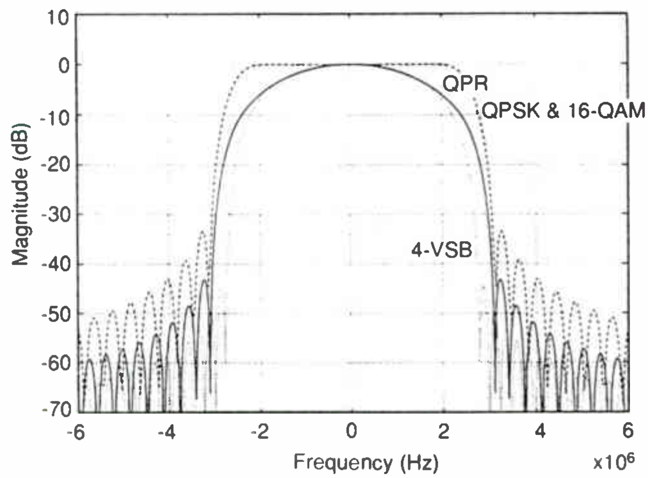
3 Use the F574A Channelizer Sr. to actually view the video on the exclusive built-in monitor. The F574A passes a full 4 MHz of video so you will see the beat, ingress, or ghosting problems on the video monitor. You simply step through your system while viewing the monitor.

Call 1-800-SENCORE! (736-2673) ext. 603

For FREE Information, A FREE Video Demonstration, Or A FREE Technical Brochure!

See us at the NCTA Show, Booth 2604. Reader Service Number 18

Figure 5: Power spectrum of the various modulation studied



Quadrature phase shift keying (QPSK) is a phase modulation technique that has four phase states per symbol located 90° apart. QPSK may be alternately described as a suppressed carrier AM technique where two independently AM modulated signal components in phase quadrature (90° apart) each have two amplitude states. These two components, known as the in-phase (I) and quadrature (Q) components are orthogonal and may be demodulated separately without mutual interference in the ideal case. Figure 3 on page 22 shows a phase state diagram for QPSK (alpha 20 percent) with the I axis horizontal and the Q axis vertical. The four areas of highest density are the four phase states; the remaining lines indicate the trajectories between phase states. With an alpha of 20 percent, QPSK can achieve a data rate of 10 Mbps in a 6 MHz bandwidth. The noise performance of QPSK is the best of any digital modulation technique.

By adding controlled ISI to QPSK, one can effectively generate a third level to each of the quadrature AM components such that the interpretation of that third-level depends on the estimate of the previous symbol state, creating a nine-state modulation format known as quadrature partial response (QPR). An eye diagram for one component of a QPR signal is shown in Figure 4 (page 22). QPR provides a higher bandwidth efficiency allowing a data rate of 12 Mbps in a 6 MHz channel bandwidth, with a slight noise performance penalty.

Another modulation method is created by the encoding of two bits in four levels in each of the quadrature AM components that allows the transmission of a total of four bits per symbol. The 4x4 states gives a total of 16 states per symbol. Hence the name 16 state quadrature AM (16-QAM). Using an alpha of 20 percent, 16-QAM allows the transmission of 20 Mbps in a 6 MHz channel. Again the addition of the additional states degrades the noise performance.

Taking only the in-phase four-level AM component and transmitting it as vestigial sideband AM improves the bandwidth efficiency, allowing a data rate of 12 Mbps to be sent in a 6 MHz channel bandwidth. This technique, unlike the double sideband AM techniques, which allow reference carrier regeneration from the transmitted signal, requires the transmission of a carrier or pilot component for a reference carrier regeneration. Referred to as 4-VSB AM, the noise performance is similar to 16-QAM.

Qualitative effects of transmission impairment

There are six main processes that contribute to errors in the demodulated data: thermal noise, phase noise, ISI, timing errors, crosstalk between I and Q, and threshold errors. In most modulation methods thermal noise is gaussian and is additive to each state of a symbol. The demodulator will incorrectly estimate the modulation state if the noise caused the instantaneous received signal to be closer to another state than the actual transmitted state. The "tails" of a gaussian distribution extend far so that even at high signal-to-noise ratios (S/N) there is still a measurable error rate.

Clearly, for a given signal level, the fewer the states in a symbol, the greater the distance between states and the lower the probability of error. That is, the fewer bits per symbol, the better the noise performance. Similarly, the lower the noise bandwidth of the receive filter, the better the performance assuming that the filter causes no ISI.

Phase noise, either introduced in the transmission path by frequency converters or in the reconstructed reference carrier, degrades performance by introducing apparent thermal noise on the received symbol and by causing crosstalk between in-phase and quadrature components in a given symbol, which reduces the effective distance between states. ISI is caused by improper filtering or reflections within the transmission path causing previous symbols to interfere with the current symbol, again reducing effective distance between symbol states ("closing the eye").

Nominally, the state estimate is made when the eye has the greatest opening, or the distance between states is the greatest. Timing errors in the clock recovery part of the demodulator cause the state estimate to be sampled either before of after the nominal time where the distance between states has been reduced, degrading the demodulator performance. Modulation techniques that use in-phase and quadrature AM components may be degraded by crosstalk between components that reduce effective distance between states. Similarly, static bias

(Continued on page 42)

Table 1: Modulation parameters

Modulation	Data rate	Transmit filter	Receive filter
QPSK	10 Mbps	Square root raised cosine, alpha 20%	Square root raised-cosine, alpha 20%, noise BW = 5 MHz
QPR BW,	12 Mbps	Partial response class 1	Maximally flat, 6 MHz noise BW = 6 MHz
16-QAM	20 Mbps	Square root raised cosine, alpha 20%,	Square root raised-cosine, alpha 20%, noise BW = 5 MHz
4-VSB AM	12 Mbps	Square root raised cosine, alpha 40%	Square root raised-cosine, alpha 40%, noise BW = 3 MHz

IN AN ERA OF LIMITS BELDEN EXPANDS YOUR OPTIONS.

New Belden® Fiber Optic Supertrunk presents another option in a full line of cables for CATV. Since the 70's, when Belden first integrated fiber optic technology into large-scale communications networks, Belden innovations have kept customers a step ahead of technological and product requirements. Now the proven benefits of Belden fiber optic technology expand the options available to Cable Television Systems.

Full line selection, combined with unsurpassed service and technical support, give you the *Belden Quality Advantage.* That means long-term savings for your business. Compare Belden's documented performance benefits to those of any other cable manufacturer:

- **Guaranteed structural return loss values** of 23dB minimum on RG-6, RG-11 and RG-59 cables.
- **100% sweep testing** of every reel of Belden drop cable, from 5 to 750 MHz for RG-6, 5 to 550 MHz for RG-59 and RG-11.
- **SuperDrop™** Cables are 100% sweep tested from 5 to 1,000 MHz, with guaranteed structure return loss of 26dB minimum.
- **Complete corrosion protection** provided by unique non-drip gel barrier in Belden's new line of aerial drop cables.
- **Highest shield effectiveness in the industry** provided by Belden's DUOBOND® PLUS . . . even greater than quad shield designs!
- **Fewer call-backs** because of Belden's tight dimensional controls and easier termination. Saves you money over the long run.
- **Turnkey system design and installation capabilities** with Belden's nationwide network of Authorized Systems Integrators.

For a FREE copy of Belden's CATV Catalog, FAX your business card to 1-319-395-9719 or call toll-free:

1-800-BELDEN-4

COOPER
Belden
Quality from Cooper Industries

Reader Service Number 20

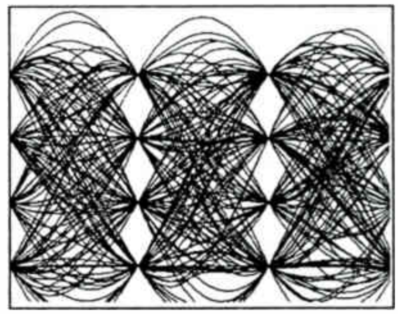
Using constellation analysis to diagnose digital transmission problems

By Joseph B. Waltrich
Manager of Analog Programs
And Marc Ryba
Senior Development Engineer
Applied Media Lab, Jerrold Communications

The video waveform monitor is universally accepted as a tool for analyzing problems with analog video transmission. Impairments such as hum, field tilt, incorrect sync and/or chroma levels, undesirable transients and other problems are easily discernable. All of these impairments are observable via the waveform monitor's display of analog voltage vs. time. However, impairments to digital transmission are not easily observed on a voltage vs. time display.

A time display of digital transmission results in an eye pattern, so called because of its resemblance to the human eye (as shown in Figure 1). All transmission impairments have the same resultant effect on this waveform. That is, they tend to "close the eye." Therefore, a more meaningful way of determining which impairments are present must be used. Constellation analysis provides such a tool.

Figure 1: 16-QAM eye diagram



Modulation review

In order to understand constellation analysis, it is helpful to review the modulation process for digital transmission. A simplified block diagram of a digital modulator is shown in Figure 2. The modulation scheme illustrated here is 16-QAM (16-level quadrature amplitude modulation) in which the input serial data stream is divided into groups of two bits and each two-bit group is converted to four analog levels, which are then modulated by in-phase and quadrature components of the carrier. The output of the modulator is the sum of the two modulated carriers. This gives a total of 16 possible combinations of transmitted data. If all of the possible data combinations are plotted in phase space (that is, the data on the quadrature carrier is plotted against the data on the in-phase carrier), the plot would look like that shown in Figure 3.

(Continued on page 50)

Figure 2: Digital modulator block diagram

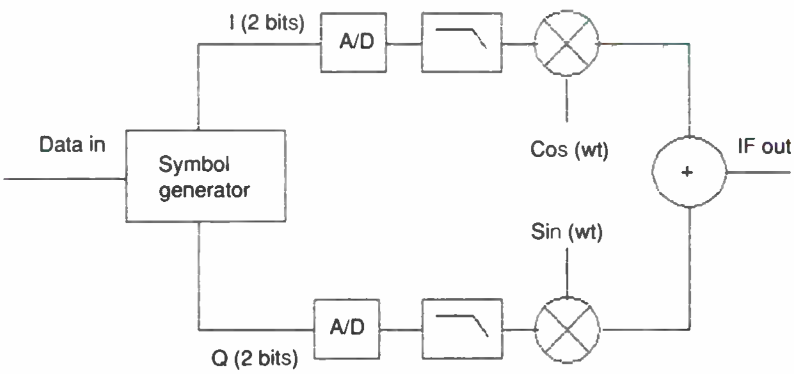


Figure 3: Constellation diagram

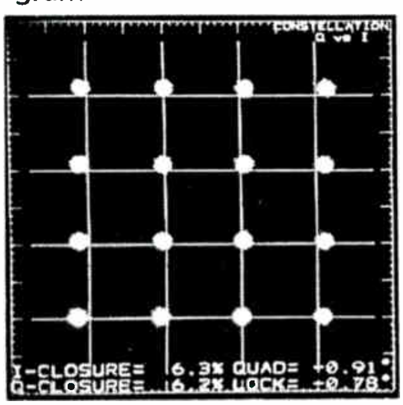
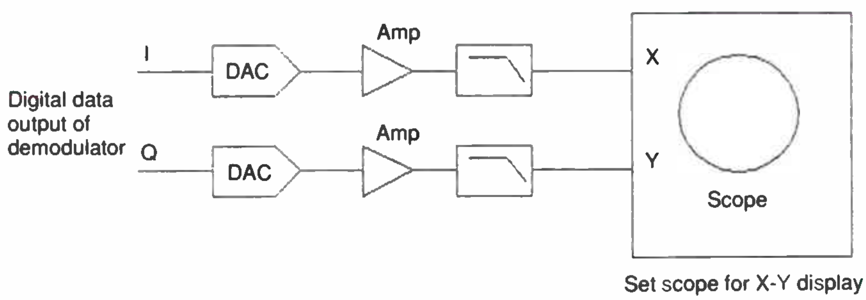


Figure 4: Constellation monitor block diagram



POWER LINE INTERFERENCE LOCATION

- Complete System For Finding Power Line Interference
- Identifies Interference Sources at Any Distance From the Headend
- Pinpoints Interference Sources to the Nearest Pole
- Small, Lightweight, Easy to Use

Now there is an instrument system that can quickly identify sources of power line interference and pinpoint them to the nearest pole.

The TRILITHIC PLI-150 is the first interference locator system specifically designed for the interference problems of the CATV industry. The PLI-150 system quickly locates all types of power TVI sources and "grades" them according to their interference potential. Using the step-by-step procedure outlined in the manual, the operator can quickly determine which of these sources is causing off-air reception problems.

The PLI-150 is a complete interference-locating system, including a mobile antenna and vehicle mount for drive-out surveys and a hand-held directional antenna for precision measurements. A high-impact plastic transit case protects the receiver and its accessories from damage when not in use.

Call 1-800-344-2412 For More Information.

TRILITHIC

9202 East 33rd Street
Indianapolis, IN 46236 USA
Telephone: (317) 895-3600

Toll Free: (800) 344-2412
FAX: (317) 895-3613

Reader Service Number 21

Measuring the impact of fiber optics

The following article was originally prepared for the SCTE's Fiber Optics Plus '92 conference.

By Richard Rexroat
Director of Fiber-Optic Technology
Tele-Communications Inc.

Without a doubt, fiber-optic technology is one of the most significant advancements in cable TV distribution in recent years. It is a development that is going to pay immediate dividends and continue to pay dividends for many years to come.

Everyone in the industry is aware of the benefits or objectives involved in electing to install fiber optics:

- Enhance the quality of pictures delivered to subscribers.
- Increase the reliability of the distribution system.
- Decrease the cost of system maintenance.
- Provide the most cost-effective means to upgrade system bandwidth.
- Provide the most cost-effective means to rebuild systems that require complete change-out of electronics and cable.
- Provide an economical but technically superior method of consolidating multiple headends.

Yet there is even more to fiber. Optical technology has the capacity to reduce operational costs, as well as lay the foundation for a myriad of new business opportunities in the future. By installing fiber, operators are assured of having a technology in place that will fully support such services as personal communications networks, high definition TV, near-video-on-demand and alternate access.

Reducing trouble calls

When analyzing cost savings, we compared fiber-optic vs. conventional RF rebuilds and upgrades. Everyone knows that fiber optics can save money by reducing the amount of electronics in a system, eliminating expensive AML sites and consolidating headends.

However, fiber also saved money by reducing the amount of trouble calls and maintenance-related truck rolls. Overall maintenance will always decrease with fiber-optic transportation, simply because of the reduced number of active electronics used. However, maintenance for the headend, cumulative leakage index and converters are not affected. Drop-in backbone fiber installations also have little effect on maintenance.

On average, TCI systems deploying optical technology reduced trouble calls by 35 percent. Specific examples of how this was accomplished are:

- Pacifica, Calif. — The system ran fiber point-to-point from Pacifica to Millbrae. This run eliminated an 11-mile supertrunk containing 28 amplifiers. The reduced amount of electronics and elimination of related power problems accounted significantly for the reduction in trouble calls. As well, fiber optics generated a large number of calls from subscribers wanting to compliment us on the improved picture quality.
- Reno, Nev. — This system also did a point-to-point run from the earth station site to the distribution headend. From there, the system ran another fiber from the headend to an AML receiver site. By replacing the AML equipment with an optical node, subscriber calls related to AML rain fade were eliminated.

It is interesting to note that one system experienced a strange twist to fiber-optic deployment. At TCI's Bennettsville, N.C., system, average monthly trouble calls equaled 5.1 percent. Within six weeks of installing fiber, trouble calls were reduced to 2.1 percent. However, nine weeks after the installation, the trouble calls were back to 5 percent. After further investigation, it was found the trouble calls were related to channels the system received off-air. Subscribers noticed that satellite channels were significantly better in quality than the off-air signals and felt fiber optics also would improve the off-air signals delivered on their cable systems.

"Optical technology has the capacity to reduce operational costs, as well as lay the foundation for a myriad of new business opportunities in the future."

Difficult to quantify

Unfortunately, in most instances, it's difficult to obtain quantitative information concerning trouble calls and reduced maintenance. Many of the systems deploying fiber are too new for such data. This type of analysis is better performed after a full year of implementation. However, even without such information, the following conclusions can be made.

- By comparing conventional rebuild costs to fiber-optic builds, we can rebuild a system for $2,000 to $3,000 per mile less than a conventional RF system.
- When deploying fiber, TCI found that by reducing the number of amplifiers in cascade, it was possible to optimize the laser performance, trading distortion for noise. This is basically a confirmation of statements made three years ago when the industry first considered fiber optics.
- At this point, cost reductions related to powering cannot be determined simply because systems: 1) must be metered, 2) contain different amperage levels and 3) generally havemore power supplies, but they operate more efficiently.
- To date, we have found 2,500 to 3,000 homes per node provide the optimum cost benefit when deploying fiber optics. In the future, it may be necessary to go down to 1,000 homes per node, or possibly even 250 homes per node. Yet, when building, TCI decided to avoid this scenario for today's systems. Instead, it has developed a migration path for new services that will allow the room to expand if necessary.

How far do we push lasers?

To build systems cost-effectively,

(Continued on page 40)

Hand Held Precision That's Affordable!

The LP-5000 series are low cost, rugged, hand held meters and sources designed for field use. These NIST traceable units are ideal for: FDDI Testing, Cable Acceptance testing, End-to-End testing of installed links, Splicing and Connectorization.

- **LP-5000 POWER METER**
  - Simple 3 button operation
  - Tests both singlemode and multimode fibers at 780, 850, 1300 and 1550nm wavelengths
- **LP-5100 series LED LIGHT SOURCES**
  - Available in 850, 1300, 850/1300 & 1300/1550nm Dual wavelength models
  - Features both Continuous Wave (CW) and Modulated modes (270Hz, 2KHz).
- **LP-5200 series LASER LIGHT SOURCES**
  - Available in 1310, 1550, and 1310/1550nm Dual wavelength models
  - Features both Continuous Wave (CW) and Modulated modes (270Hz, 2KHz).

LP-5000 series Hand Held Fiber Optic Power Meters and Light Sources

laser precision ... *The Industry's Standard for Excellence*

109 North Genesee Street • Utica, NY 13502 • (315) 797-4449 • FAX (315) 798-4038
European Office: P.O. Box 81094 • 3009 G.B. Rotterdam, Holland • 31-10-451-1510 • FAX 31-10-451-8667
Brazilian Office: AGC Optosystems • Rua Panacu, 54-Ipiranga • São Paulo, SP-CEP.04264, Brazil • 55-11-273-8566 • FAX 55-11-274-3997

Reader Service Number 22

Fiber troubleshooting and emergency restoration

By K. Charles Mogray Jr.
Applications Engineering Manager, Comm/Scope Inc.

The process of troubleshooting a fiber-optic cable system begins by identifying the component that has failed. This is normally done by a logical process of elimination. The four major components of a fiber system are the transmitter, receiver, patch cords/pigtails/connectors and the fiber-optic cable. Table 1 shows typical faults with these components and what to do about them. Using a power meter and an optical time domain reflectometer (OTDR), most failures can be quickly identified. Unfortunately, the repairs and/or replacements may not be so quick.

The flow figure (below) shows how to troubleshoot and locate faults in a fiber system. The process begins by measuring the output power of the transmitting device. This is usually measured directly at the output connector/sleeve of the transmitter using an optical power meter. Received power is compared to that recorded when the equipment was installed and as specified by the equipment manufacturer.

The next step consists of checking output power through any patch cords/sleeves installed at the transmit end of the fiber system. Patch cords, pigtails, connectors and/or sleeves may be defective or damaged and should be replaced by substitution using a unit that is known to be good. Again, assuming measured power is within installed or specified values, the next step is to go to the receive end of the fiber system and measure received power through the passive fiber cable system.

Using the same process of elimination, received power is checked with an optical power meter through the patch cords/sleeves up to the receiver. If measured power is within specification, then it is safe to assume that the problem is in the receiving equipment.

Cable problem

If the process of elimination indicates that the fiber-optic cable is the problem, then an OTDR or other test device is required to pinpoint the fault. When using an OTDR, do not confuse

(Continued on page 53)

Cable troubleshooting/fault locating

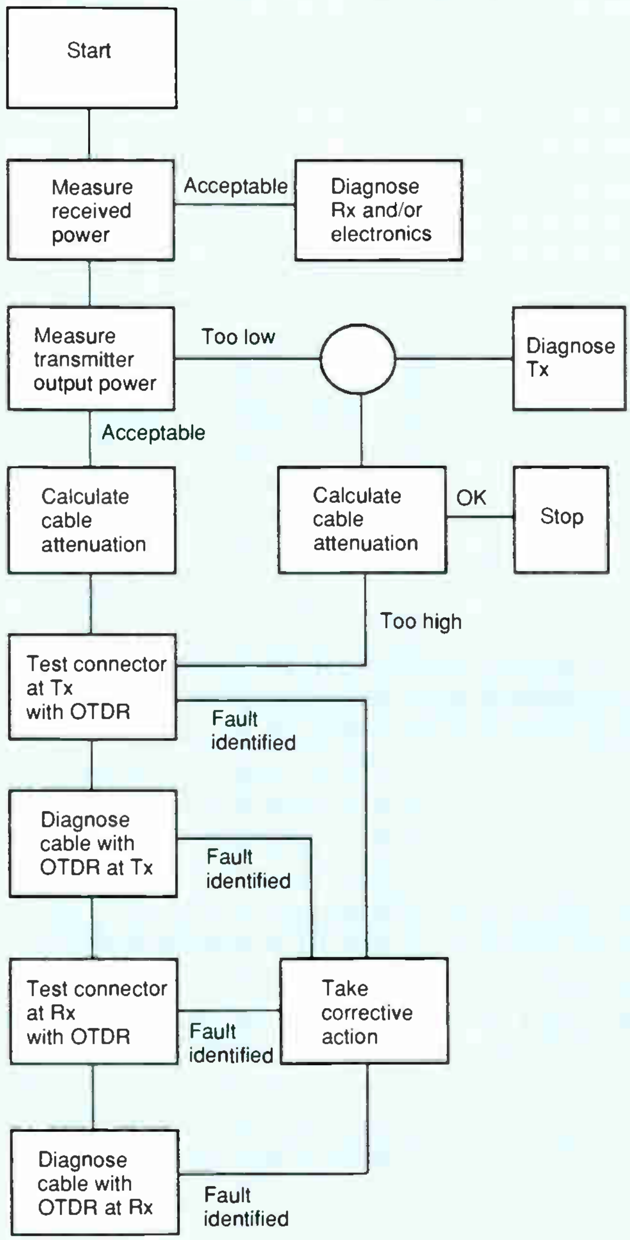


Table 1: Typical fiber cable system faults

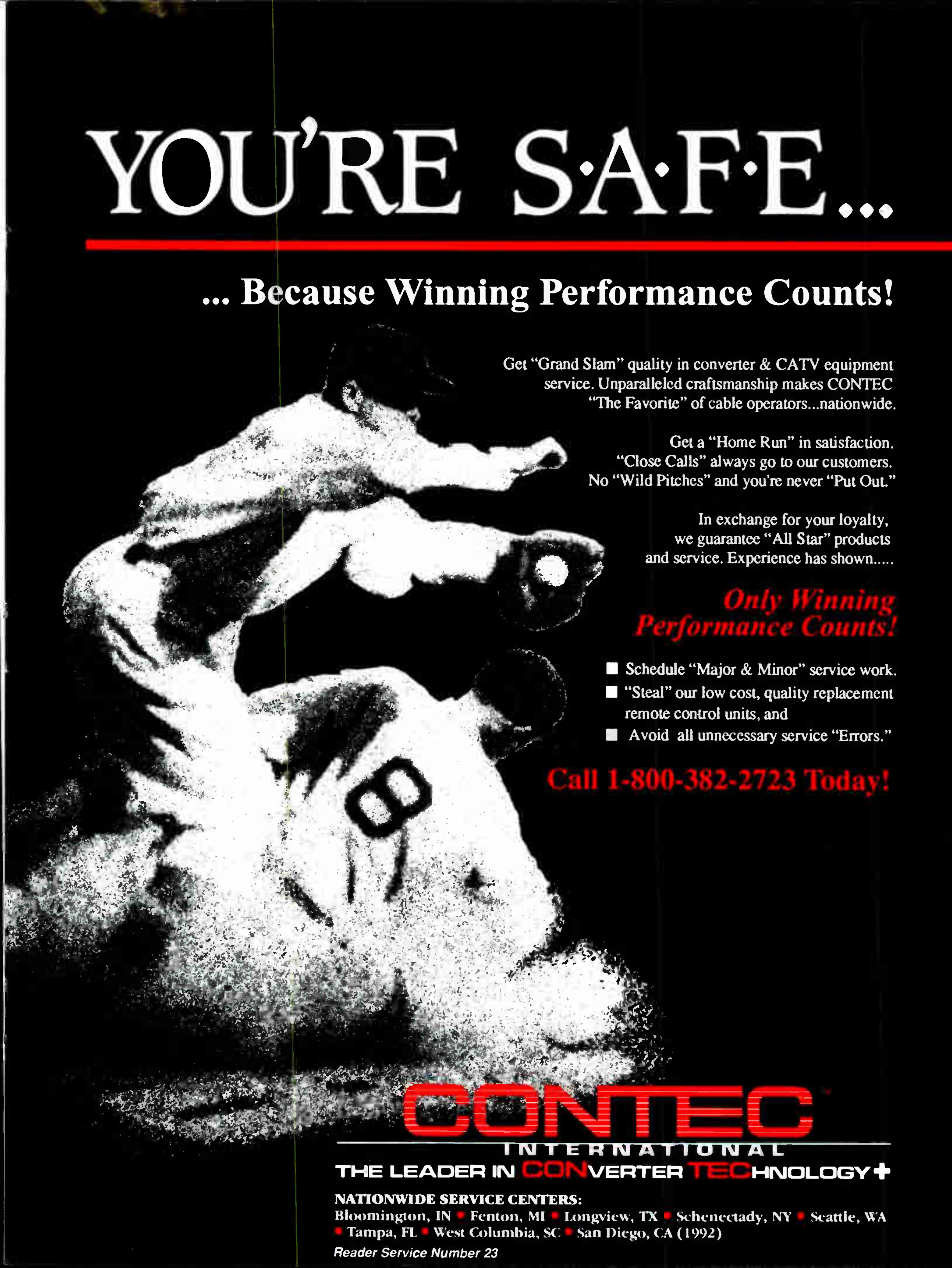
Fault	Cause	Solution
• Patch cord faulty	Dirt or damage	Clean or replace
• Pigtail faulty	Dirt or Damage	Clean or replace
• Sleeve faulty	Dirt or damage	Clean or replace
• Increase in cable attenuation	Kinked/damaged cable or splice point	Re-splice or replace
• Fiber break	Kinked/damaged cable or splice point	Re-splice or replace

Table 2: Emergency restoration of fiber system

Key requirements:
- Rapid temporary restoration
- Graceful transition to permanent repair

Recommendations:
- Develop a plan for emergency restoration
- Plan for material, equipment and labor for emergency restoration
- Prioritize circuits for re-splicing
- Develop a plan for permanent repair

Restoration materials and equipment:
- Develop a list of required materials and equipment
- Strategically locate required materials and equipment throughout system
- Purchase (or make) an emergency restoration kit


YOU'RE S·A·F·E...
... Because Winning Performance Counts!
Get "Grand Slam" quality in converter & CATV equipment service. Unparalleled craftsmanship makes CONTEC "The Favorite" of cable operators...nationwide.
Get a "Home Run" in satisfaction. "Close Calls" always go to our customers. No "Wild Pitches" and you're never "Put Out."
In exchange for your loyalty, we guarantee "All Star" products and service. Experience has shown.....
Only Winning Performance Counts!
Schedule "Major & Minor" service work.
"Steal" our low cost, quality replacement remote control units, and
Avoid all unnecessary service "Errors."
Call 1-800-382-2723 Today!
8
CONTEC
INTERNATIONAL
THE LEADER IN CONVERTER TECHNOLOGY
NATIONWIDE SERVICE CENTERS:
Bloomington, IN • Fenton, MI • Longview, TX • Schenectady, NY • Seattle, WA • Tampa, FL • West Columbia, SC • San Diego, CA (1992)
Reader Service Number 23

Find that fiber!

By Norman L. Elsasser
Marketing Development Manager
3M Telecom Markets Division

It's 1995 and a technician who works for a major northeastern U.S. cable TV company is dispatched to initiate cable service for the owners of a newly constructed home in a planned residential development on the outskirts of Boston. In 1989, when the land for the subdivision was surveyed, parcelled into lots and excavated for the utility infrastructure of electric power, cable TV and telephone service to the 925 individual houses planned in the suburban development hard recessionary times fell on the area. Long before the first house was built, the property went into foreclosure.

As the recession eased and construction began to increase in the region, new houses were built in the subdivision, and then it was time to turn on utility services. Arriving at the subdivision, the technician finds a jumble of cables in the route, each containing 12 bundles of eight optical fibers. Looking for "Bundle 11, Yellow" has become a confusing task. To make matters worse, the colors have faded and it's difficult to distinguish the red fibers from the yellow.

The fiber boom

Since 1989, optical fiber has been going into service at an unprecedented rate. In many areas, fiber is being installed in new residential and commercial construction projects long before the structures are built on lot sites. Technicians are dispatched to initiate cable service months and sometimes years after the utility infrastructure is installed.

As more optical fiber cable goes into service, the ability to identify, test and maintain individual fibers has become more critical. Because optical fibers carry so much traffic, misidentification of individual fibers can result in staggering costs if service is interrupted. Complicating the picture is the fact that fiber-optic system designs have become increasingly complex.

Now, when the cable system for a new housing development is designed, for example, the optical fibers are bundled into groups within the cable, and "drops" are made at each lot. Systems are designed to go from points A to Z, with drops made along the way at points C, G, K, N and so on. Later, when construction is finished, the CATV technician returns to initiate service for the new customers.

Further, routes today may contain cables with 144 fibers — or 12 bundles of 12 color-coded fibers. So when a technician goes out into the field to activate one of the spare live fibers, he must identify which of the colored and bundled fibers is the correct one.

Critical business of identifying fibers

There are several factors that make the potential for misidentification high: the difficulty in distinguishing between light and dark fibers; a high potential for breaking fibers in the process of identification; the fact that the coloring used to code individual fibers may fade over time; and the possibility of contamination of the test equipment itself. Let's detail each of these problems:

Light vs. dark. Risks that the technician faces here include identifying the wrong fiber as dark when it may in fact be light — and could be transmitting up to 54 broadband channels. Fibers are carrying critical traffic, so it could cost many thousands of dollars if a fiber is shut down by mistake. Therefore, the need to accurately identify individual fibers is becoming increasingly critical and pervasive as the installation of optical fiber proliferates and fiber counts increase.

Accidental breakage. There is high potential for breakage or fatiguing of the fibers during the process of identification and testing because of the fragility of fiber strands. With many fiber identification test instruments, technicians use triggers or buttons to clip onto the fiber. The force applied varies among technicians — some push the trigger with more force than others — and excessive force can break or fatigue the fiber.

Fading of color. As fiber-optic cables age, the dyes used to originally color-code individual fibers fade. Generally, the dyes begin to pale, making it difficult to distinguish between yellows and reds, and blues and greens.

Test instrument sensitivity. Another

"As usage of CATV fiber systems becomes more prevalent, it is evident that a more sensitive identifier is needed."

problem technicians encounter in trying to identify live fibers involves the optical sensitivity, or dynamic range, of the identifying equipment. Many instruments are unable to pick up low-level signals and indicate that a fiber is dark when in fact it may be operational.

Test instrument contamination and/or malfunction. The reliability of test instruments is critical in identifying optical fibers. If the test instrument is malfunctioning, or if the signal detection electronics in the unit have been contaminated with dust particulates from the atmosphere, there is high potential for misreading light fibers.

Equipment designed to overcome problems

As more and more fiber goes into service, the demand from cable companies has accelerated recently for identification and test instruments that are accurate and reliable, and technician-friendly.

Manufacturers of identification and test equipment for fiber optics seek to minimize the problems associated with fiber identification through new designs and use of software technology. Since optical fiber identification is a relatively new science, particularly in the field environment, much of the equipment developed in the late 1980s lacked certain capabilities required for accurate testing of light fibers, in the following areas:

Optical sensitivity or "dynamic range." Many of the test instruments on the market since the late 1980s contained detectors that were not sensitive enough to pick up low-level signals in a fiber.

Clipping mechanisms. Accidental breaking or fatiguing of the fiber is a major risk with equipment that contains a lever or clipping device because the

(Continued on page 55)

A New Addition To The Blonder-Tongue AGILE Family

IRD-2001 Rack Miser Only 1.75″ High.

- **Only 1.75″ high to conserve rack space**
- **Rock solid 100 KHz PLL tuning accuracy**
- **Dual down-converter circuitry**
- **70 MHz IF loop for insertion of TI filters**
- **Textbook video quality**

Commercial grade, frequency agile, C/KU-Band satellite receiver and Commercial Videocipher® Descrambler now available from Blonder Tongue in a low profile, 1.75″ high, rack mount unit. PLL tuning gives easy access to C/KU-Bands and all scrambled cable programming. Optional IF bandwidth and a second agile broadcast quality demodulator are available.
Available Now. Call 908-679-4000 for further information.

BLONDER TONGUE LABORATORIES

The Standard of Quality in TV Signal Distribution

One Jake Brown Road, Old Bridge, N.J. 08857
Phone: 908-679-4000. Fax: 908-679-4353

See us at the NCTA Show, Booth 3049.   *Reader Service Number 79*

FCC report and order: The new rules for cable TV

If buying a new copy of the "Code of Federal Regulations" is not in your budget, here's all the changes to Part 76 applicable to cable TV, taken from Appendix C of the Federal Communications Commission report and order on cable TV technical and operational requirements adopted Feb. 13, 1992 (released March 4, 1992).

Part 76 of Chapter I of Title 47 of the *Code of Federal Regulations* is amended to read as follows:

1. Section 76.5 is amended by adding paragraph (jj) to read as follows:

§ 76.5 Definitions.

* * * * *

(jj) Rural Area. A community unit with a density of less than thirty households per route mile of coaxial and/or fiber optic cable trunk and feeder line.

* * * * *

2. Section 76.305 is amended by revising paragraphs (a) and (c) to read as follows:

§ 76.305 Records to be maintained locally by cable system operators for public inspection.

(a) Records to be maintained. The operator of every cable television system having 1,000 or more subscribers shall maintain for public inspection a file containing a copy of all records which are required to be kept by § 76.205(d) (origination cablecasts by candidates for public office); § 76.221(f) (sponsorship identifications); § 76.79 (EEO records available for public inspection); § 76.601(c) (proof-of-performance test data); and § 76.601(e) (signal leakage logs and repair records).

* * * * *

(c) The records specified in paragraph (a) of this section shall be retained for the period specified in §§ 76.205(d), 76.221(f), 76.79, 76.601(c), and 76.601(e), respectively.

* * * * *

3. Section 76.601 is amended by revising paragraphs (a) and (b), adding paragraphs (c), (d) and (e), and by deleting the concluding note. It is to read as follows:

§ 76.601. Performance tests.

(a) The operator of each cable television system shall be responsible for insuring that each such system is designed, installed, and operated in a manner that fully complies with the provisions of this subpart. Each system operator shall be prepared to show, on request by an authorized representative of the Commission or the local franchiser, that the system does, in fact, comply with the rules.

(b) The operator of each cable television system shall maintain at its local office a current listing of the cable television channels which that system delivers to its subscribers.

(c) The operator of each cable television system shall conduct complete performance tests of that system at least twice each calendar year (at intervals not to exceed seven months), unless otherwise noted below, and shall maintain the resulting test data on file at the operator's local business office for at least five (5) years. The test data shall be made available for inspection by the Commission or the local franchiser, upon request. The performance tests shall be directed at determining the extent to which the system complies with all the technical standards set forth in § 76.605(a) and shall be as follows:

(1) For cable television systems with 1,000 or more subscribers but with 12,500 subscribers or less, proof-of-performance tests conducted pursuant to this section shall include measurements taken at no less than six (6) widely separated points within each mechanically continuous set of cables within the cable television system. Within the cable system, one additional test point shall be added for every additional 12,500 subscribers or fraction thereof (e.g., 7 test points if 12,501 to 25,000 subscribers; 8 test points if 25,001 to 37,500 subscribers, etc.). Such proof-of-performance test points shall be balanced to represent all geographic areas served by the cable system. Within each mechanically continuous set of cables, at least one-third of the test points shall be representative of subscriber terminals most distant from the system input in terms of cable length. The measurements may be taken at convenient monitoring points in the cable network: **Provided,** that data shall be included to relate the measured performance of the system as would be viewed from a nearby subscriber terminal. An identification of the instruments, including the makes, model numbers, and the most recent date of calibration, a description of the procedures utilized, and a statement of qualifications of the person performing the tests shall be set forth.

(2) Proof-of-performance tests to determine the extent to which a cable television system complies with the standards set forth in § 76.605(a)(3), (4), and (5) shall be made on each of the NTSC or similar video channels of that system. Proof-of-performance tests for all other standards in § 76.605(a) shall be made on a minimum of four (4) channels plus one additional channel for every 100 MHz, or fraction thereof, of cable distribution system upper frequency limit (e.g., 5 channels for cable television systems with a cable distribution system upper frequency limit of 101 to 216 MHz; 6 channels for cable television systems with a cable distribution system upper frequency limit of 217 to 300 MHz; 7 channels for cable television systems with a cable distribution upper frequency limit of 300 to 400 MHz, etc.). The channels selected for testing must be representative of all the channels within the cable television system.

(3) The operator of each cable television system shall conduct semi-annual proof-of-performance tests of that system, to determine the extent to which the system complies with the technical standards set forth in § 76.605(a)(4) as follows. The visual sig-

BROADCAST PREMIER.

Presenting the Drake ESR 1240 Integrated Receiver/Decoder.

Drake has been in business long enough to know what you demand in an IRD.

The Drake ESR 1240 IRD delivers high performance in an affordable, compact unit that combines a commercial grade satellite receiver with an integrated VideoCipher® II Plus Commercial Descrambler Module.

The ESR 1240 IRD uses a new low noise 70 MHz IF with threshold extension to provide the best possible picture and low data error rates under weak signal conditions.

Convenient front panel access.

The ESR 1240 IRD's front panel design allows easy access to the descrambler module without having to remove the unit from its rack mounted position.

Two front panel LEDs show sync and authorization status of the descrambler module. A two-digit LED display indicates C band channel selection. Channels 1-24 can be tuned in by the ESR 1240 IRD's front panel channel selection switch and fine tuning control.

VideoCipher® II Plus is a registered trademark of General Instrument Corporation. Ownership or possession of a ESR 1240 IRD with a VideoCipher® II Plus Commercial Decoder does not entitle owner or possessor to receive descrambled signals without authorization by the programmer.

VideoCipher® II Plus Decoder Module warranteed separately by General Instrument Corporation.

Complete video and audio reception control.

When a signal is received, video output is automatically switched between descrambled video and normal clamped video, providing crisp, clear video from either scrambled or unscrambled signals. Also, digital stereo audio is available with a choice of balanced or unbalanced outputs for left and right channels. The subcarrier audio demodulator is tunable from the front panel.

Famous Drake quality.

Backed by a one-year limited warranty, the Drake ESR 1240 IRD complies with and exceeds the latest industry standards. All in a highly reliable, efficient and affordable unit designed with you, the cable operator, in mind.

Because Drake has made its business on knowing your business.

Contact us for the name of your nearest Drake distributor.

DRAKE®

R. L. Drake Company
P.O. Box 3006, Miamisburg, Ohio 45343 U.S.A.
Sales: (513) 866-2421, Fax: (513) 866-0806
In Canada: (705) 742-3122
Service and Parts: (513) 746-6990

Made in America by Drake...a world leader in communication products since 1943.

© Copyright 1992 The R. L. Drake Company.

nal level on each channel shall be measured and recorded, along with the date and time of the measurement, once every six hours (at intervals of not less than five hours or no more than seven hours after the previous measurement), to include the warmest and the coldest times, during a 24-hour period in January or February and in July or August.

(4) The operator of each cable television system shall conduct triennial proof-of-performance tests of that system to determine the extent to which the system complies with the technical standards set forth in § 76.605(a)(11), (12), and (13).

(d) Successful completion of the performance tests required by paragraph (c) of this section does not relieve the system of the obligation to comply with all pertinent technical standards at all subscriber terminals. Additional tests, repeat tests, or tests involving specified subscriber terminals may be required by the Commission or the local franchiser to secure compliance with the technical standards.

(e) The provisions of paragraphs (c) and (d) of this section shall not apply to any cable television system having fewer than 1,000 subscribers: **Provided, however,** that any cable television system using any frequency spectrum other than that allocated to over-the-air television and FM broadcasting (as described in § 73.603 and § 73.201) is required to conduct all tests, measurements and monitoring of signal leakage that are required by this subpart. A cable television system operator complying with the monitoring, logging and the leakage repair requirements of § 76.614, shall be considered to have met the requirements of this paragraph. However, the leakage log, shall be retained for five years rather than the two years prescribed in § 76.614.

* * * * *

4. Section 76.605 is amended by revising paragraphs (a) and (b), by revising Note (1), by renaming Note (2) as Note (3) and by adding a new Note (2). It is to read as follows:

§ 76.605 Technical Standards.

(a) As of [6 months and 90 days following publication in the Federal Register], unless otherwise noted, the following requirements apply to the performance of a cable television system as measured at any subscriber terminal with a matched impedance at the termination point or at the output of the modulating or processing equipment (generally the headend) of the cable television system or otherwise as noted. The requirements are applicable to each analog NTSC or similar video downstream cable television channel in the system:

(1) The cable television channels delivered to the subscriber's terminal shall be capable of being received and displayed by TV broadcast receivers used for the off-the-air reception of TV broadcast signals, as authorized under Part 73 of this chapter.

(2) The aural center frequency of the aural carrier must be 4.5 MHz ±5 kHz above the frequency of the visual carrier at the output of the modulating or processing equipment of a cable television system, and at the subscriber terminal.

(3) The visual signal level, across a terminating impedance which correctly matches the internal impedance of the cable system as viewed from the subscriber terminal, shall not be less than 1 millivolt across an internal impedance of 75 ohms (0 dBmV). Additionally, as measured at the end of a 100 foot cable drop that is connected to the subscriber tap, it shall not be less than 1.41 millivolts across an internal impedance of 75 ohms (+3 dBmV). (At other impedance values, the minimum visual signal level, as viewed from the subscriber terminal, shall be the square root of 0.0133(Z) millivolts and, as measured at the end of a 100 foot cable drop that is connected to the subscriber tap, shall be 2 times the square root of 0.00662(Z) millivolts, where Z is the appropriate impedance value.)

(4) The visual signal level on each channel shall not vary more than 8 decibels within any six-month interval which must include four tests performed in six-hour increments during a 24-hour period in July or August and a 24-hour period in January or February, and shall be maintained within:

(i) 3 decibels (dB) of the visual signal level of any visual carrier within 6 MHz nominal frequency separation;

(ii) 10 dB of the visual signal level on any other channel on a cable television system of up to 300 MHz of cable distribution system upper frequency limit, with a 1 dB increase for each additional 100 MHz of cable distribution system upper frequency limit (e.g., 11 dB for a system at 301-400 MHz; 12 dB for a system at 401-500 MHz, etc.); and

(iii) A maximum level such that signal degradation due to overload in the subscriber's receiver or terminal does not occur.

(5) The rms voltage of the aural signal shall be maintained between 10 and 17 decibels below the associated visual signal level, and shall be maintained at levels not to cause interference to the upper adjacent channel. This requirement must be met both at the subscriber terminal and at the output of the modulating and processing equipment (generally the headend).

(6) The amplitude characteristic shall be within a range of ±2 decibels from 0.75 MHz to 5.0 MHz above the lower boundary frequency of the cable television channel, referenced to the average of the highest and lowest amplitudes within these frequency boundaries.

(7) The ratio of RF visual signal level to system noise shall be as follows:

(i) From [90 days following publication in the Federal Register to 1 year thereafter], shall not be less than 36 decibels.

(ii) From [1 year and 90 days following publication in the Federal Register to 2 years thereafter], shall not be less than 40 decibels.

(iii) As of [3 years and 90 days following publication in the Federal Register], shall not be less than 43 decibels.

(iv) For class I cable television channels, the requirements of paragraphs (a)(7)(i), (a)(7)(ii) and (a)(7)(iii) of this section are applicable only to:

(A) Each signal which is delivered by a cable television system to subscribers within the predicted Grade B contour for that signal;

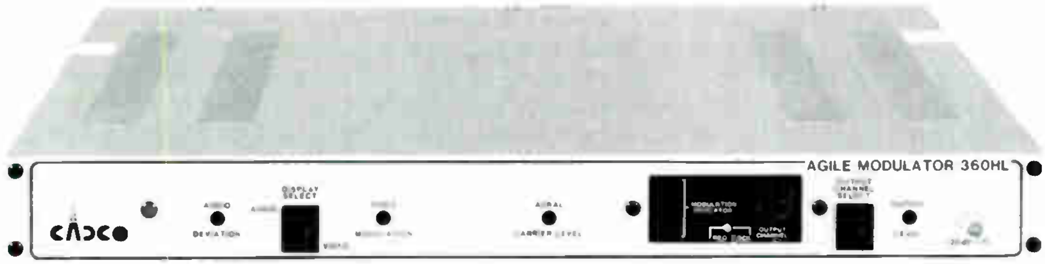
(B) Each signal which is first picked up within its predicted Grade B contour;

(C) Each signal that is first received by the cable television system by direct video feed from a TV broadcast station, a low power TV station, or a TV translator station.

(8) The ratio of visual signal level to the rms amplitude of any coherent dis-

AGILE PLUS

Proven reliability PLUS added Features



The time-proven CADCO Agile line of Modulators, Processors and Demodulators now offer PLUS FEATURES:

- RS-232 CONTROL OPTION at 4 SELECTABLE BAUD RATES
- FULL SUB-LOW T-Channel AGILITY T-7 thru T-14*
- EXTENDED OUTPUT TO 550 MHz OPTION
- RELIABLE SURFACE MOUNT TECHNOLOGY
- INTERNATIONAL DUAL CARRIER AUDIO

these features are PLUS to the regular popular CADCO features like:

- NTSC • PAL • SECAM
- INTERNATIONAL TELEVISION SYSTEMS B/G - D/K - I - M/N
- AUTOMATIC INPUT CORRECTION
- AUTOMATIC FCC OFFSET OUTPUT (defeatable)
- MICROPROCESSOR CONTROL
- PHASE-LOCKED SYNTHESIZED OSCILLATORS
- AMERICAN MANUFACTURED & 2-YEAR WARRANTY

CADCO is simply the most user friendly, advanced-technology frequency agile equipment anywhere at any price.

* Demodulator Option

CADCO

BROADBAND COMMUNICATIONS

Made in U.S.A.

2405 S. Shiloh Garland, Texas 75041

1-800-877-2288 FAX 214-271-3654 214-271-3651

Reader Service Number 26

turbances such as intermodulation products, second and third order distortions, or discrete-frequency interfering signals not operating on proper offset assignments shall be as follows:

(i) The ratio of visual signal level to coherent disturbances shall not be less than 51 decibels for noncoherent channel cable television systems, when measured with modulated carriers and time averaged; and

(ii) The ratio of visual signal level to coherent disturbances which are frequency-coincident with the visual carrier shall not be less than 47 decibels for coherent channel cable systems, when measured with modulated carriers and time averaged.

(9) The terminal isolation provided to each subscriber terminal:

(i) Shall not be less than 18 decibels. In lieu of periodic testing, the cable operator may use specifications provided by the manufacturer for the terminal isolation equipment to meet this standard; and

(ii) Shall be sufficient to prevent reflections caused by open-circuited or short-circuited subscriber terminals from producing visible picture impairments at any other subscriber terminal.

(10) The peak-to-peak variation in visual signal level caused by undesired low frequency disturbances (hum or repetitive transients) generated within the system, or by inadequate low frequency response, shall not exceed 3 percent of the visual signal level.

As of [3 years and 90 days following publication in the Federal Register], the following requirements apply to the performance of the cable television system as measured at the output of the modulating or processing equipment (generally the headend) of the system:

(11) The chrominance-luminance delay inequality or chroma delay, which is the change in delay time of the chrominance component of the signal relative to the luminance component after passing through the system, shall be within 170 nanoseconds.

(12) The differential gain for the color subcarrier of the television signal, which is measured as the difference in amplitude between the largest and smallest segments of the chrominance signal (divided by the largest and expressed in percent), shall not exceed ±20%.

(13) The differential phase for the color subcarrier of the television signal which is measured as the largest phase difference in degrees between each segment of the chrominance signal and reference segment (the segment at the blanking level of 0 IRE), shall not exceed ±10 degrees.

(14) As an exception to the general provision requiring measurements to be made at subscriber terminals, and without regard to the type of signals carried by the cable television system, signal leakage from a cable television system shall be measured in accordance with the procedures outlined in § 76.609(h) and shall be limited as follows:

Frequencies	Signal leakage limit (μV/m)	Distance in meters
Less than and including 54 MHz, and over 216 MHz	15	30
Over 54 up to and including 216 MHz	20	3

(b) Cable television systems distributing signals by using methods such as nonconventional coaxial cable techniques, noncoaxial copper cable techniques, specialized coaxial cable and fiber optical cable hybridization techniques or specialized compression techniques or specialized receiving devices, and which, because of their basic design, cannot comply with one or more of the technical standards set forth in paragraph (a) of this section, may be permitted to operate: **Provided,** that an adequate showing is made pursuant to § 76.7 which establishes that the public interest is benefited. In such instances, the Commission may prescribe special technical requirements to ensure that subscribers to such systems are provided with an equivalent level of good quality service.

Note 1: Local franchising authorities of systems serving fewer than 1,000 subscribers may adopt standards less stringent than those in § 76.605(a). Any such agreement shall be reduced to writing and be associated with the system's proof-of-performance records.

Note 2: For systems serving rural areas as defined in § 76.5, the system's local franchising authority may adopt standards less stringent than those in §§ 76.605(a)(3), 76.605(a)(7), 76.605(a)(8), 76.605(a)(10), 76.605(a)(11), 76.605(a)(12), and 76.605(a)(13). Any such agreement shall be reduced to writing and be associated with the system's proof-of-performance records.

* * * * *

5. Section 76.606 is to be added to read as follows:

§ 76.606 Closed Captioning.

(a) The requirements for closed captioning are as follows:

(i) As of [90 days following publication in the Federal Register], the operator of each cable television system shall not take any action to remove or alter closed captioning data contained on line 21 of the vertical blanking interval; and

(ii) As of July 1, 1993, the operator of each cable television system shall deliver intact closed captioning data contained on line 21 of the vertical blanking interval, as it arrives at the headend or from another origination source, to subscriber terminals and (when so delivered to the cable system) in a format that can be recovered and displayed by decoders meeting § 15.119 of the Rules.

* * * * *

6. Section 76.607 is to be added to read as follows:

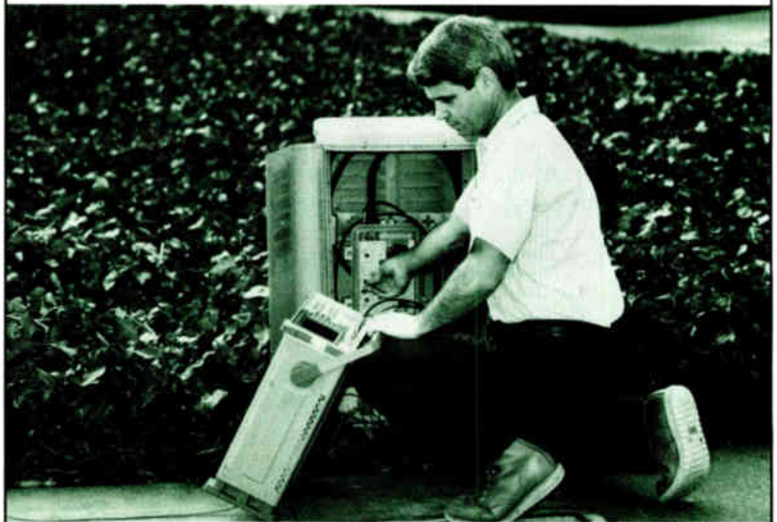
§ 76.607 Resolution of Complaints.

Cable system operators shall establish a process for resolving complaints from subscribers about the quality of the television signal delivered. These records shall be maintained for at least a one-year period and be available for inspection by the Commission and franchising authority, upon request. Subscribers shall be advised, at least once each calendar year, of the procedures for resolution of complaints by the cable system operator, including the address of the responsible officer of the local franchising authority.

NOTE: Prior to being referred to the Commission, complaints from subscribers about the quality of the television signal delivered must be re-

Reader Service Number Number 27

HP lowers your CATV test time at the push of a button.



HP's portable CATV analyzer speeds up troubleshooting.

When there's trouble in your CATV System, find it fast. The HP 85711A portable CATV analyzer's labor-saving functions cut test time. Its system sweep and troubleshooting capabilities locate problems quickly. And intuitive, softkey operations make it easy to use. Prices start at just $9,000*. Add our system monitoring software for preventive maintenance and choose from a wide variety of other options to meet your specific needs.

So start saving test time now. **Call 1-800-452-4844,** and ask for **Ext. 2991**. We'll send you a video tape and data sheet that explain how the HP 85711A portable analyzer makes faster CATV testing push-button easy.

There is a better way.

© 1992 Hewlett-Packard Co. TMSAD207/CT

HEWLETT PACKARD

* U.S list price.

See us at the NCTA Show, Booth 1406.

ferred to the local franchising authority and the cable system operator.

* * * * *

7. Section 76.609 is to be amended to revise paragraph (d)(2), the last sentence in paragraph (e), paragraph (g), the first sentence in paragraph (h), and paragraph (h)(2), to replace paragraph (i), and to add paragraph (j). It is to read as follows:

§ 76.609 Measurements.

* * * * *

(d)(2) By using either a multiburst generator or vertical interval test signals and either a modulator or processor at the sending end, and by using either a demodulator and either an oscilloscope display or a waveform monitor display at the subscriber terminal.

(e) * * * Alternatively, measurements made in accordance with the NCTA Recommended Practices for Measurements on Cable Television Systems, 2nd edition, November 1989, on noise measurement may be employed.

* * * * *

(g) The terminal isolation between any two terminals in the cable television system may be measured by applying a signal of known amplitude to one terminal and measuring the amplitude of that signal at the other terminal. The frequency of the signal should be close to the midfrequency of the channel being tested. Measurements of terminal isolation are not required when either (1) the manufacturer's specifications for subscriber tap isolation based on a representative sample of no less than 500 subscriber taps or (2) laboratory tests performed by or for the operator of a cable television system on a representative sample of no less than 50 subscriber taps, indicates that the terminal isolation standard of § 76.605(a)(9) is met. To demonstrate compliance with § 76.605(a)(9), the operator of a cable television system shall attach either such manufacturer's specifications or laboratory measurements as an exhibit to each proof-of-performance record.

(h) Measurements to determine the field strength of the signal leakage emanated by the cable television system shall be made in accordance with standard engineering procedures.

* * * * *

(h)(2) Field strength shall be expressed in terms of the rms value of synchronizing peak for each cable television channel for which signal can be measured.

(i) For systems using cable traps and filters to control the delivery of specific channels to the subscriber terminal, measurements made to determine compliance with § 76.605(a)(5) and (6) may be performed at the location immediately prior to the trap or filter for the specific channel. The effects of these traps or filters, as certified by the system engineer or the equipment manufacturer, must be attached to each proof-of-performance record.

(j) Measurements made to determine the differential gain, differential phase and the chrominance-luminance delay inequality (chroma delay) shall be made in accordance with the NCTA Recommended Practices for Measurements on Cable Television Systems, 2nd edition, November 1989, on these parameters. **CT**

Impact of fiber optics

(Continued from page 28)

another question posed was: How far can a laser be pushed in today's environment — without getting in trouble?

By experimenting, it was possible to take a single fiber with 62 channels 19.9 miles with modulated specs of 55 dB C/N, 65 dB CTB and 65 dB CSO at the fiber node. (The lasers used are Optical Networks International's Laser Link II.) From there, a second laser was used to feed a cascade of four amplifiers, resulting in overall continuous wave performance specifications of 49 dB C/N, 53 dB CTB and 53 dB CSO at the subscriber tap. Using this cascaded laser design, TCI systems are able to go a distance of 40 miles from the headend.

An important question is: How reliable is such a design? For the past year, the Puerto Rico system has been closely monitored to judge the operational impact of such a design. After a year in operation, the system's 19.5-mile run, with the original transmitter and receiver, has not required a single readjustment. To ensure reliability, proofs are preformed every 30 days to monitor system performance.

Future considerations

It's no secret that TCI is currently doing a near-video-on-demand test with AT&T and US West. Neither is it a secret that TCI also is testing personal communications networks with McCaw Cellular in Oregon (see "News," page 12). Neither test involves experimentation with new technology, but both will yield important information on marketability of new service.

As we wait for the data to come in, engineers are faced with another question: How do operators design today's systems to meet existing requirements while still being flexible enough to meet tomorrow's business needs?

Take a look at some systems currently putting in 90 fibers. Is it really necessary to install this much capacity? The overall transmission capacity of fiber is unbelievable.

TCI's policy is to install four fibers at the node. But what if this is an insufficient number? What if the future requires six fibers at the node? The need today is to concentrate on maximizing the existing capacity of a single fiber. If this is done, it doesn't matter whether there are four, six or eight fibers at the node. If fiber is used to its fullest capacity, 90 fibers may be a bit much and there will always be a significant amount of fiber at the node.

Of course, no one is advocating only a single fiber at the node. There are already companies interested in leasing available dark fibers from cable systems — an interest with real implications in today's market. Rather, the message is simply that the industry has not researched the technology well enough to fully use a single fiber's capacity. And because technology will change quickly, it's possible that a single fiber could be used for more than one service.

Using digital technology

Another thought when considering future business is the operational impact of digital delivery on an analog cable system. For years now, the industry has been deploying fiber optics in an effort to reduce operational and maintenance costs. Rebuilds and upgrades using fiber optics have reduced capital expenditures, while improving picture quality. But now, digital transmission will pose new challenges.

No one realized digital could be problematic in a broadband environment. Although operators have been subjected to countless discussions of digital transmission's benefits, no one has discussed the real-world impact of a digital overlay on an analog system beyond just the technological impact.

Let's look at what the industry has done. Everyone has worked to reduce operating costs. Profit margins are up, systems are operating as cost-effectively as possible and the number of operational personnel has been minimized.

Now that the industry is at this point, maintenance and operations will increase 25 to 50 percent when digital transmission is deployed. Systems will have to run tighter and better to offer high-quality services. Subscribers who pay $10,000 for an HDTV receiver will expect to receive the highest resolution possible.

This is an issue that must be addressed when contemplating the use of digital delivery. To date, both CableLabs and AT&T are testing the effects of a digital overlay on an analog system. The results of these tests are critical to cable TV operators. It's important to know and understand exactly how this technology will impact cable TV systems.

Summary

Fiber optics is definitely the most significant advancement in cable TV distribution in recent years. It not only pays immediate dividends, it is the foundation for future technologies. It has been demonstrated again and again that fiber reduces trouble calls — in TCI's case, by 35 percent.

But there are other issues to consider as the industry moves forward. It is necessary to focus on such issues as fully utilizing the existing capacity of a single fiber, as well as realizing the full impact of digital on today's cable systems.

Ten years ago, the industry viewed life as complicated when it came to providing quality entertainment services. With the diversity of new opportunities available today, it's going to get more complicated. Operators need to fully explore each technology and its operational impact if the cable TV industry is to stay on the leading edge. **CT**

Compression impact

(Continued from page 19)

ator, who would control the conditional access parameters.

The TV receiver provides signal access (tuning) and display. Subscriber access and control to premium services is provided by the plug-in decoder, which would decrypt the digital signal and decode the compressed signal. Since all of this happens inside the receiver, the customer benefits because all of the features of the receiver are retained. The cable operator gains not only from having a more satisfied customer but also from minimizing capital outlay — a relatively inexpensive add-on decoder module vs. a less user-friendly addressable set-top terminal. The decoder would not require a tuner or other redundant circuitry. In addition, power and cabinet costs are reduced.

The accompanying figure (page 18) displays a system that allows the subscriber to receive conventional NTSC, HDTV and digitally compressed NTSC. In addition, various levels of premium services are supported. The subscriber with the HDTV receiver has the added benefit of not requiring a set-top terminal, thereby enjoying all the features of his TV receiver. **CT**

A CLEAR ADVANTAGE

The Eagle SIS Decoding Filter descrambles high frequency channels economically with little or NO video loss!

Compare the new Eagle Sideband Interdiction System (SIS)* to competitive products. At high frequencies, Eagle SIS decoding filters reproduce an image as clear as the original while others produce washed-out pictures that lack sharpness.

The Eagle SIS system operates at 450 MHz and higher with no *jamming carriers* so there is no video deterioration. **In fact, video enhancement is possible if desired.**

For complete specifications, contact your Eagle marketing representative today.

Reasons to Buy Eagle SIS Decoding Filters
• Near Perfect Descrambling • Video Enhancement Possible • Convenient Size • Economical Price • High Channel Application • Security Improved by High Channel Usage • Extended Threaded Ends • Available Now!

See us at the NCTA Show, Booth 1323. ***Reader Service Number 28***

EAGLE
COMTRONICS INC.

Headquarters: 4562 Waterhouse Road, Clay, NY 13041 • (315) 622-3402 • Toll Free 800-448-7474 • FAX (315) 622-3800 **U.S. & Canada:** Anixter: 800-323-8166 • FAX 708-677-0743
Canada: Deskin Sales: 416-475-1412 **Belgium:** Electro Service 32-15-20-95-75
England: ABP Ltd: 0256-881525 **Norway:** Cablecom AS: 47-34-79630
Germany: Stodiek: 211-41-7010 **France:** Sachs France 33-1-39-86-29-62

* Patent Pending

Modulation methods

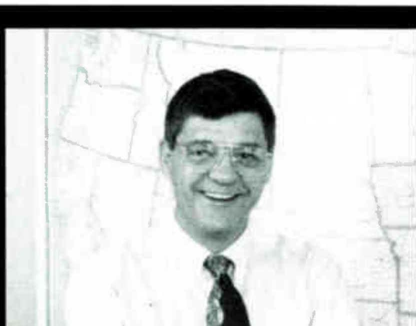
(Continued from page 24)

errors in either phase or amplitude that offset the decision threshold of some symbol states relative to their nominal position will degrade the noise performance of the demodulator.

Simulation program and channel model

To evaluate the effects of the channel and the filter distortion on various modulation types, a simulation program was written in MATLAB language. (MATLAB is an interactive program for numerical linear algebra, matrix computation and signal processing.) The simulation was done using the complex baseband representation of the bandpass modulated signal, meaning a carrier frequency of 0 Hz. The complex baseband representation permits us to sample the time waveform of the studied modulation at a better rate than what would be necessary if we were using a high carrier frequency. This is done without losing generality and keeping the same properties as a band-limited signal modulating a high frequency carrier. All the parameters of the simulation are normalized to the symbol rate and the filter bandwidths are specified as a ratio of the symbol rate instead of hertz.

The modulator block is an information source that, in the program, is composed of multiple pseudo random binary sequence (PRBS) generators and two digital-to-analog converters (D/A) — one in-phase and one in-quadrature. The simulation being numerical, frames of 4,096 complex samples are formed by the sampling of 512 symbols with eight samples per symbol.



On technical excellence...

"Our company was founded by engineering people designing and constructing systems for themselves. Utilizing state of the art test equipment along with technical advances and our highly trained staff, we have maintained a tradition of quality and technical excellence over the past four decades. From mapping, design, construction and turn on to complete proof of performance testing on both the fiber and RF segments of the system, our customers are assured of receiving the best services available."

Dave Sanders, V.P. of Engineering

CABLE CONSTRUCTORS, INC.

COMPLETE TURNKEY CONSTRUCTION 1-800-338-9299

Reader Service Number 29

The filters and the channel in the system are modeled as finite impulse response digital filters and the coefficients for these filters are real for symmetric filters or complex for asymmetric filters. The filtering is done in the time domain if both the input signal and the filter coefficients are real by convolving the signal with the filter coefficients. If the signal or the filter coefficients are complex, the filtering is done in the frequency domain by using a 512 point fast fourier transform (FFT) and the overlap-and-add method for processing long records, instead of doing two or four convolutions in the time domain. The program also generates all the conventional filter responses plus raised-cosine[2], square root raised-cosine, partial response and various channel distortions. The group-delay of the designed filters can be specified independently of the magnitude response enabling us to simulate any type of filter technologies like SAW filters, digital filters or LC filters.

After the signal is passed through the filters and the channel, the signal is demodulated synchronously. In a complex baseband signal, the carrier frequency is zero but the phase of the received signal is unknown and is function of the delay between the modulator and the demodulator. The demodulator extracts the I and Q components along two orthogonal axis offset in phase relative to the modulator phase reference in order to minimize the cross-correlation between I and Q components. The demodulated samples are then resampled by the symbol clock. If the sampling instant falls between demodulated samples, the values at that sampling instant are then estimated by linear interpolation that gives accurate results for a sampling rate to symbol rate of eight or more.

The bit error rate (BER) measurement is based on the quasi-analytical (QA)[3] instead of the direct Monte-Carlo simulation. For linear systems this technique permits accurate measurements of low BERs without excessive computation. In the QA technique, also referred to as the hybrid simulation, a simulation is done without the addition of noise and with a source data pattern long enough to obtain all the possible combinations of ISI.

A histogram of the clock sampled data is then built, the noise is added analytically to the bins of the histogram, and the average symbol error rate is calculated. To convert the average symbol error rate to BER vs. energy per bits normalized (Eb/No), we need to calibrate our system by measurements of the signal power in the channel, the receiver noise bandwidth and the number of bits per symbol.

Quantitative effects of transmission impairments

We considered the following impairments to a digital signal and divided them in two categories:

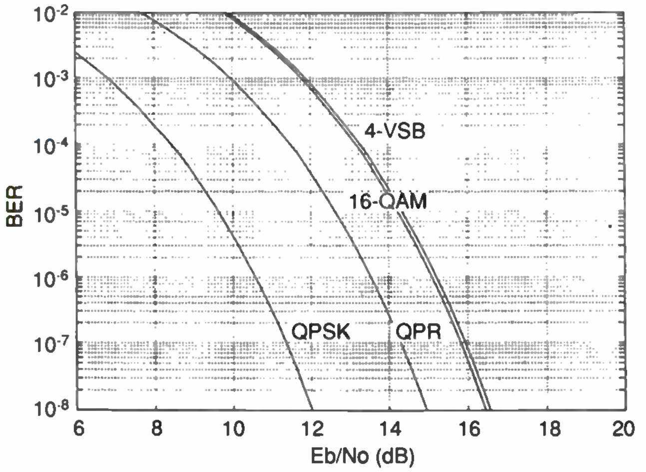
1) Hardware imperfections:
- Quadrature error
- Phase error
- Symbol timing error

2) Channel distortion are as follows:
- Linear slope across passband
- Sinusoidal ripple across passband

The quadrature error is the deviation from orthogonality of the transmitter or the receiver, the symbol timing error is the deviation from the optimal sampling instant. These two errors


FiberFone® brand talk sets are the first optical field telephones designed for real world conditions. Even in the dirt and the rain, FiberFones give technicians fast, reliable communications between work locations. Used during the installation, maintenance and restoration of fiber optic cables, FiberFones are the "butt-ins" of the fiber world.
Just connect one spare single mode or multimode fiber and press the CALL button. When the other end answers you have a perfect full duplex communications channel that is good for distances up to 100 km. Multiple work locations can be conferenced together over one fiber so everyone can talk and listen at the same time.
Other features like built-in fiber identification tone, stabilized CW source for loss measurements, optional headset and operation from a variety of power sources make FiberFones useful on any fiber operation . . . even on a nice sunny day.
THE FIRST FIBER OPTIC FIELD TELEPHONE TRULY ENGINEERED FOR DIRT RAIN HEAT MUD SNOW AND HUMIDITY
Industrial Technology, Inc.
P.O. Box 190
2001 FM 1821 South
Mineral Wells, Texas 76067
Tel (817) 325-9461
FAX (817) 325-2255
Industrial Technology
Reader Service Number 30

Figure 6: Theoretical BER performance (without impairment) of QPSK, QPR, 16-QAM and 4-VSB AM



are usually due to initial adjustment error or drift caused by components aging or temperature change. The phase error is an indirect measurement of the system sensitivity to phase noise. If the component of the phase noise is a sinusoidal waveform with a frequency less than the symbol rate, the BER degradation due to the untracked RMS phase noise give similar results to the same static phase error in the recovered carrier relative to the optimal carrier phase. This result was verified by simulating both degradations as well as by comparing our data with the results of Tranter, et al.[4]

To simulate the channel distortions encountered in a cable plant, we designed two linear phase filters, a linear slope filter and a ripple filter.[5] The slope is defined as the number of decibel variation in a 6 MHz bandwidth. The ripple error is generated by a three tap FIR filter. This filter simulates three path propagation and can simulate the effect of reflection due to mismatch and the triple transit in SAW filters.

The bit rate and the filters for each modulation method in the simulation are selected to have a null-to-null bandwidth of 6 MHz using sharp filters that are today's state-of-the-art. The resultant RF spectrum for each of the modulation methods simulated is shown in Figure 5 on page 34. The bit rate and filters used are shown in Table 1 (page 34).

Theoretical performance for each of these modulation methods is shown in Figure 6. Examining these results would suggest that while QPSK is the most robust, there is not much difference among the rest. These results do not take into account the relative sensitivities to distortions and demodulator imperfections.

Results for a "typical" cable channel

Elsewhere in the literature cited at the end of this article[1] results are presented showing the BER degradation of the four modulation types studied in the presence of a single non-optimal condition. In an actual system all forms of degradation will be present in varying degrees simultaneously. The results of each impairment do not linearly contribute to the total system performance degradation, thus it is necessary to model the system with all impairments included. In an attempt to understand the performance of these modulation methods in a "typical" cable environment,

Reader Service Number 31

Reader Service Number 32

STOCKING DISTRIBUTOR

OF THE FINEST CATV HARDWARE

Made in the USA

JOSLYN
Manufacturing Co.

PREFORMED
Line Products

DIAMOND
Communication Products, Inc.

Pole line hardware—drop hardware—forged, cast, and finished in America by the leading manufacturers in our industry.

All available NOW from:

SERVING THE CABLE INDUSTRY SINCE 1964

Cable Services Company/Inc.

2113 MARYDALE AVENUE, WILLIAMSPORT, PA 17701-1498
ONE NUMBER NATIONWIDE: 1-800-326-9444 • FAX 717-322-5373

See us at the NCTA Show, Dallas, TX, Booth #1134.

Reader Service Number 33

Table 3: Comparison of "typical" cable performance at 10^{-6} BER

Modulation type	Eb/No (dB)	Rate/BW (dB)	C/N* (dB)	Degradation (dB)
QPSK	12.2	3.8	16	1.6
QPR	16.2	4.6	20.8	2.7
16-QAM	25.2	6.8	32	10.1
4-VSB AM	26.1	3.8	29.9	10.9

* Note: Equivalent C/N in 4.2 MHz noise bandwidth video channel

erances in manufacturing would be required than for QPSK or QPR. QPR on the other hand, appears to be an attractive alternative to QPSK, providing 20 percent greater data rate with a relatively small penalty in C/N and very little additional complexity in implementation.

Conclusion

Four digital modulation techniques have been studied (QPSK, QPR, 4-VSB AM, and 16-QAM). They are capable of providing data rates between 10 and 20 Mbps in a 6 MHz bandwidth and are suitable for transmission of digital audio or compressed digital video. A time domain simulation program has been written that allows accurate simulation of the entire modulation-transmission-demodulation process and calculates error performance. The simulation allows imperfect filters, timing errors, quadrature errors, phase noise and bias errors to be included explicitly.

The results suggest that QPSK and QPR are significantly more rugged than 4-VSB AM or 16-QAM. QPR offers 20 percent greater bandwidth than QPSK with only a minor increase in signal power. Since 4-VSB AM does not offer any advantages over QPR and is much less rugged, it does not appear to be an attractive alternative. If the higher data rate offered by 16-QAM is essential, a significantly more complex demodulator would be required to provide acceptable performance, and then only with an 11 dB higher signal than QPR. **CT**

References

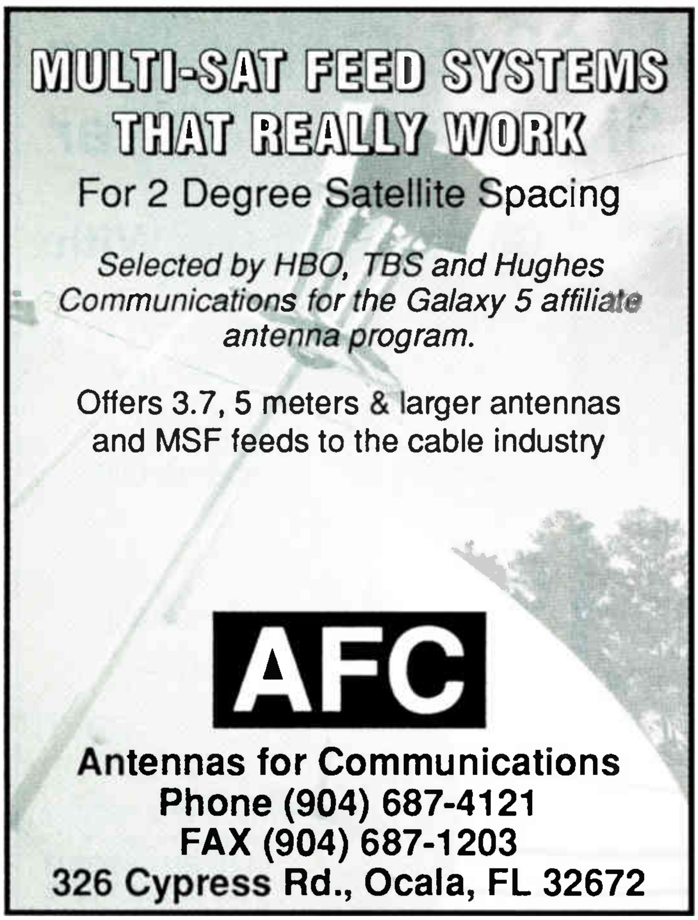
[1] John D. Oetting, "A Comparison of Modulation Techniques for Digital Radio," *IEEE Transactions on Communications*, Vol. COM-27, No. 12, December 1979.

[2] Kamilo Feher, *Advanced Digital Communications, Systems and Signal Processing Techniques*, Prentice-Hall, 1987.

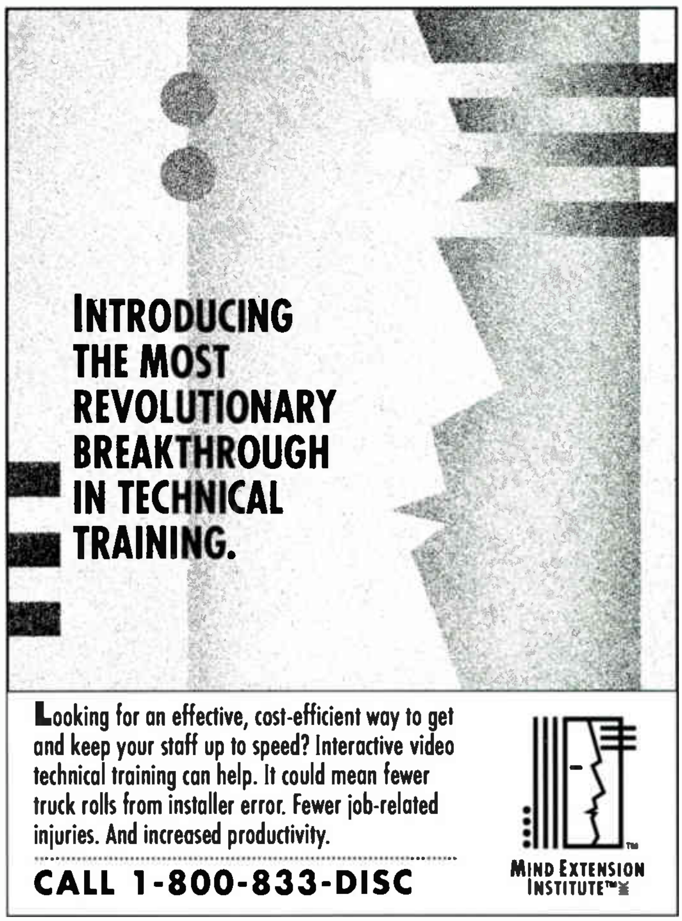
[3] Michael J. Jeruchim, "Techniques for Estimating the Bit Error Rate in the Simulation of Digital Communications Systems," *IEEE Journal on Selected Areas in Communications*, Vol. SAC-2, No. 1, January 1984, p. 153-170.

[4] Walter R. Braun, et al., "CLASS: A Comprehensive Satellite Link Simulation Package," *IEEE Journal on Selected Areas in Communications*, Vol. SAC-2, No. 1, January 1984, p. 129-137.

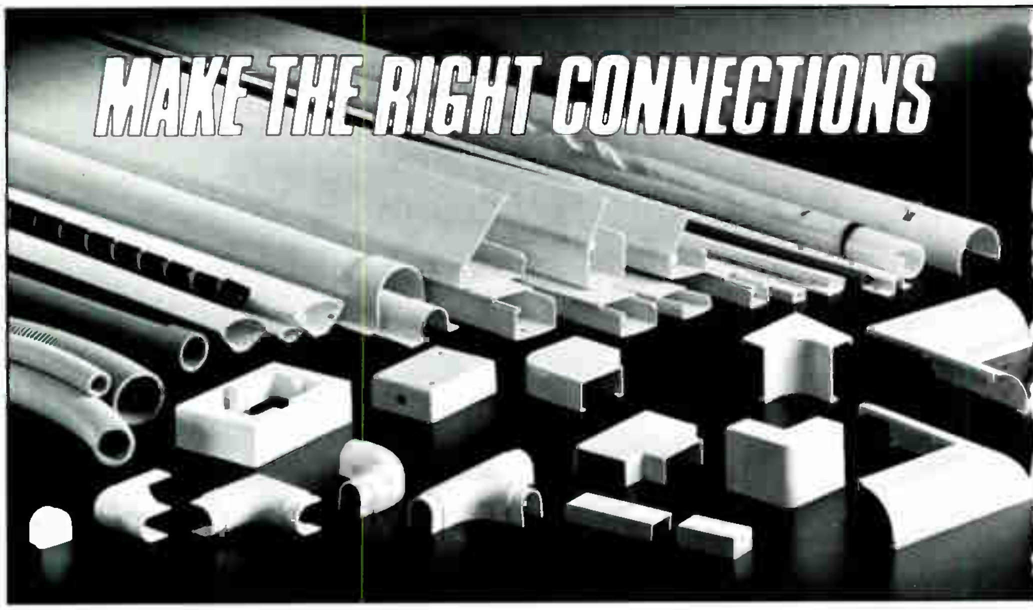
[5] William H. Trantor, et al., "Simulation of Communications Systems Using Personal Computers," *IEEE Journal on Selected Areas in Communications*, Vol. SAC-6, No. 1, January 1988, p. 13-23.



Reader Service Number 36



Reader Service Number 37



Quality Cabletek moldings and connectors ensure a professional installation every time. Cabletek's value and service meet your specialized needs. Durable, dependable and attractive in exterior or interior installations.

▼

Cabletek
WIRING PRODUCTS

Cabletek enclosures securely cover your connections. And they're built to last. Cabletek stocks both metal and plastic enclosures in many sizes and colors. Designed to meet your specific needs.

▼

Cabletek
WIRING PRODUCTS

Cabletek stocks a complete line of accessories for your cable installation needs. Next day delivery is available anywhere in the USA on in-stock items.

▼

Cabletek
WIRING PRODUCTS

MAKE THE RIGHT CHOICE.

Reader Service Number 38

Phone: (216) 365-3889
FAX: (216) 322-0321
1150 Taylor St.
Elyria, OH 44035 U.S.A.

Constellation analysis

(Continued from page 26)

This is actually a vector diagram where the transmitted signal is the vector sum of the data on the in-phase and quadrature carriers (hereafter called I and Q data). Expressed mathematically, the transmitted data is:

$$X(t) = I(t) + Q(t) \qquad \textbf{(1)}$$

Where:
$X(t)$ = transmitted data at time t
$I(t)$ = I data at time t
$Q(t)$ = Q data at time t

Since it is not necessary to show anything but the tips of the vectors, the resulting constellation diagram is always shown as a group of points.

Demodulation process

The demodulation process is the reverse of the modulation process. The signal is multiplied by in-phase and quadrature components of the carrier to recover the I and Q components. The four-level I and Q signals are then converted to digital form and recombined to generate a serial data output. In the absence of channel impairments, the output signal is, presumably, identical to the modulator input data.

Although 16-QAM is shown here as an example, other modulation schemes may be used. Among these are 64-QAM, in which three bits are converted to eight levels per phase, and 256-QAM, for which four bits are used to generate 16 levels per phase. Since the choice of modulation format is a topic unto itself, further discussion of constellation diagrams will be confined to 16-QAM. Transmission impairments affect all forms of quadrature amplitude modulation in the same manner.

Figure 7: Constellation impaired by random noise

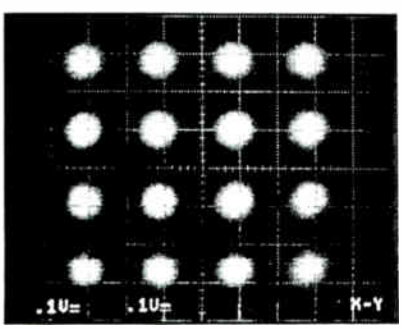


Figure 5: Discrete interference vector diagram

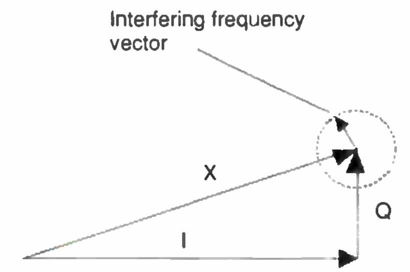
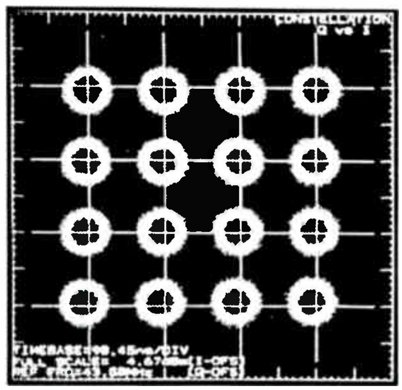


Figure 6: Discrete interference constellation



The only difference is one of degree.

The hardware implementation of a constellation analyzer is rather simple and is shown in Figure 4 on page 26. The demodulated I and Q data are applied to two inputs of an oscilloscope (that has X-Y display capability) to obtain the constellation. The primary purpose of constellation analysis is to provide a visual check of what impairments are present in the transmission channel. When the constellation analyzer is used in conjunction with a bit error rate tester, impairments can be quantified as well as identified.

Constellation analysis is useful for determining the effect of the following impairments:

- Discrete frequency interference
- Random noise
- Reflections
- Phase noise

A vector diagram illustrating the effect of discrete frequency interference is shown in Figure 5. The interfering carrier is a vector that is added to each point in the constellation. Since the phase of the carrier continuously varies with respect to the signal, the points appear as circles. The radius of the circles is proportional to the level of the interfering carrier. Expressed mathematically, the equation for the received single becomes:

$$X(t) = I(t) + Q(t) + f(t) \qquad \textbf{(2)}$$

Where the vector $f(t)$ is the interfering frequency whose phase $ø(t)$ varies with time.

An actual constellation with discrete frequency interference is shown in Figure 6.

Since random noise has a broadband spectrum, when noise is added to the signal, the effect is that of adding multiple vectors with varying amplitudes and phase. This results in a "smearing" of each point in the constellation as shown in Figure 7. The amount of point spreading is proportional to the carrier-to-noise ratio (C/N). A detailed discussion of the effect of noise on digital transmission may be found in Lee and Messerschmitt's *Digital Communication* (Kluwer Academic Publishers, 1988).

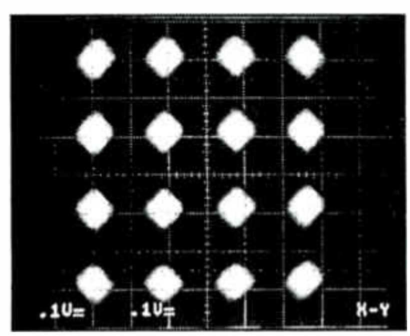
The effect of reflections on digital transmission depends on the number of echoes, their respective delays and their phase relative to the demodulating carrier. For a single reflection, the received signal may be expressed as:

$$r(t) = I(t)\cos(w_c t) + K^*I(t-\tau)\cos[w_c(t-\tau)] + Q(t)\sin(w_c t) + K^*Q(t-\tau)\sin[w_c(t-\tau)] \qquad \textbf{(3)}$$

Where:
K = attenuation of reflected signal ($K < 1$)
τ = delay of reflected signal
W_c = carrier frequency
$I(t-\tau)$ = amplitude of I signal at time $t-\tau$
$Q(t-\tau)$ = amplitude of Q signal at time $t-\tau$

Demodulation and filtering of the received signal is mathematically equivalent to multiplying the I component by cos

Figure 8: Effect of reflections



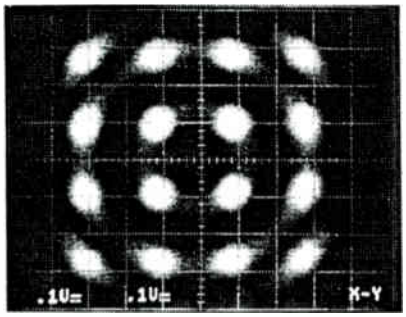
If you're like many cable systems, you're paying way too much for cable. Too much in rebuilds because of moisture and corrosion damage. Too much in truck rolls because of cold weather conductor pullouts. Too much in upgrades because the bandwidth couldn't live up to the demand. Too bad. Because it doesn't cost any more to specify 1 GHz bandwidth, triple-bonded Times Fiber trunk and feeder cable up front. And then reap the rewards of superior cable technology all the way down the line. Call 1 (800) 677-CATV.

TFC TIMES FIBER COMMUNICATIONS, INC.®
an
LPL company

358 Hall Ave. • P.O. Box 384 • Wallingford, CT 06492

See us at the NCTA Show, Booth #1430. Reader Service Number 39

Figure 9: Effect of phase noise



($w_c t$) and the Q component by $\sin(w_c t)$ and throwing out the double frequency terms. The resultant equations are:

$$r_I(t) = I(t) + K[I(t-\tau)\cos(w_c\tau) - Q(t-\tau)\sin(w_c\tau)] \quad (4)$$

$$r_Q(t) = Q(t) + K[Q(t-\tau)\cos(w_c\tau) - I(t-\tau)\sin(w_c\tau)] \quad (5)$$

Where:
$r_I(t)$ = demodulated I component
$r_Q(t)$ = demodulated Q component

If the preceding equations are plotted in vector form for all possible values of I and Q, the result is a miniature replica of the entire constellation about each point in the original constellation. The size of the replicated constellation is equal to K times the size of the original constellation and the replicated constellation is rotated by an angle $w_c\tau$ relative to the original constellation. (If $w_c\tau$ is close to 45°, the constellation has the so-called "16 of diamonds" look as in Figure 8 on page 50.)

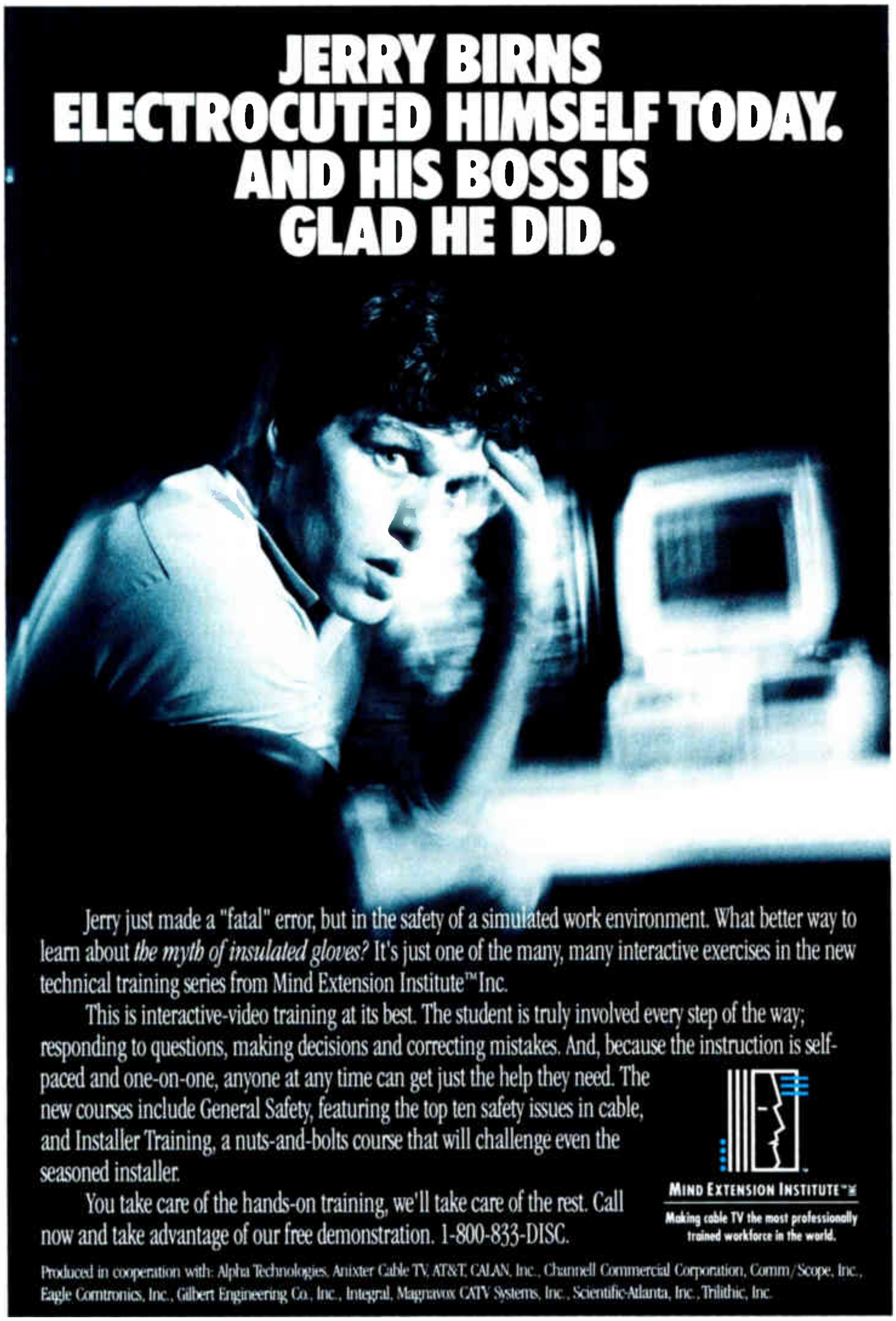
Multiple reflections occurring at various levels and delays will result in a number of superimposed replicas of the original constellation, producing a pattern that looks similar to that generated by random noise. However, if one echo is dominant, as is frequently the case in cable systems, the pattern will still have a square or diamond-shaped configuration.

Phase noise is largely a function of the stability of the local oscillator in either the modulator or the demodulator (usually the demodulator). When the receiver demodulates with a carrier having excessive phase jitter, the received constellation will oscillate about its center as shown in Figure 9. If the demodulating frequency is incorrect, the result will be a continuously rotating constellation.

At this point, it would be worthwhile to consider the implications of constellation analysis for cable transmission of digital signals. In a cable environment, noise is not generally a problem. Most systems have C/N levels in the neighborhood of 48 dB or better and, even if the digital signal is transmitted at reduced power, errors would not occur until the C/N becomes less than about 22 dB. Reflections, on the other hand, tend to cause errors in digital transmission at levels that are not noticeable on analog signals.

In particular, unterminated drops on the distribution system and unterminated cables in the customer's home can cause significant problems. This condition is typical of all drops terminated by a cable-ready receiver or a VCR. Phase noise would generally indicate a converter phase-locked loop malfunction.

The net result of all transmission channel impairments is to generate bit errors. Although all digital transmission systems proposed to date will contain powerful error correction schemes, error correction shouldn't be regarded as a cure-all for system problems. System impairments will still need to be found and corrected. Just as the video waveform monitor has been a useful tool for detection of analog transmission impairments, constellation analysis will provide a tool for detection of digital transmission problems. **CT**



Visit booth #2484 at the NCTA Show and participate in "Operation Safety . . . where everyone's a winner."
Reader Service Number 40

Table 3: Emergency cable restoration alternatives

Cable cut with retrievable slack

1) Locate damage point with OTDR
2) Retrieve slack
3) Splice fibers with temporary mechanical splices
4) Verify end-to-end continuity utilizing OTDR or light source and power meter
5) Make transition to permanent repair as soon as possible

Cable cut with no slack

1) Locate damage point with OTDR
2) Install new cable
3) Splice in new piece of cable with temporary mechanical splices
4) Verify end-to-end continuity utilizing OTDR as soon as possible
5) Make transition to permanent repair as soon as possible

Note: Downtime can be further reduced by the use of an emergency restoration kit.

FO troubleshooting

(Continued from page 30)

resolution with accuracy.

Many times management becomes frustrated with what appears to be an inability of the technician to pinpoint the break. There are many variables that must be considered in order to effectively locate a break in fiber cable. For this reason, documentation and training is critical with fiber systems.

Unfortunately, an extrinsic reason is the usual cause of fiber problems. The normal result is a total failure of random fibers within the cable sheath. The failure is normally of the catastrophic type. Extrinsic reasons include rodents, lightning, ground faults, gunshots, freezing water in conduits, vandalism, excavation, damaged poles (especially from auto accidents) and failures at splice points caused by poor craftsmanship. Improper closure assembly and/or poor storage of the fiber or cable within the closure assembly or hand hole also can result in failures.

Restoration

Once the cause of system failure has been determined, measures must be taken to restore the cable system. Standard procedures for restoration should be established by the CATV operator. Tables 2 (page 30) and 3 outline emergency restoration procedures and alternatives. In many cases, the operator will need to work with the local utility operator to restore service. It is important to have an agreement with the owner of the utility pole line as to priorities of restoration in the case of downed poles. Additionally, the availability (or lack thereof) of "slack" cable will usually dictate your course of action in the field.

Restoration can range from simply transferring system operation from one

(Continued on page 68)

Table 4: Typical emergency restoration kit

1) Restoration splice trays
2) Two pre-drilled splice closures
3) Approximately 150 feet fiber cable
4) Temporary mechanical splice parts (twice count of active fibers)
5) Two complete tool kits consisting of:
   a) Alcohol packs
   b) Gel-off packs
   c) 88 vinyl tape
   d) Miller stripping tool
   e) Book of numbers
   f) Kim wipes
   g) Diagonal side cutting pliers
   h) Pliers
   i) Wrenches
   j) Cable sheath knife
   k) Ty-raps
   l) Snips
   m) Precision cleaving tool

See us at the NCTA Show, Booth 1614. Reader Service Number 41

Regal
Performance
Silver Series Trap

When you install a Regal Silver Series Trap, you can look forward to years of trouble-free performance. Count on it!

No Water Migration
Thanks to a single piece, machined housing with rolled, interlocking edge. Instead of "O" rings, end ports are integral to the inner and outer sleeves, and sealed with a weather resistant adhesive. This design prevents sleeve spinning too.

No Corrosion
Because the housing is made of nickel plated brass.

Superior EMI Performance
Due to more metal-to-metal contact in the single piece housing.

Stable Performance Across a Full Temperature Range
With a typical notch depth of better than 65 dB from -40° to +140° F. Custom, thermally-stable capacitors have been designed for each channel.

Call **1-800-36-REGAL** now for your **FREE** Regal Silver Series Trap Sample Kit.

REGAL
Technologies Ltd.
1-800-36-REGAL

The Society of Cable Television Engineers presents a

Video BREAKOUT!

Due to popular demand, SCTE is now making videotapes of workshops and panel discussions presented at its groundbreaking 'Cable -Tec Expo '91' technical conference available as individual items. Previously available only in the 'Cable-Tec Expo '91 Video Package,' these classic tapes include:

T-1098—*OSHA Regulations: Safety in the Workplace*—An in-depth look at safety requirements and records.
T-1099—*Satellite Proof-of-Performance Measurements*—How to install, test and maintain satellite antenna feeds.
T-1100—*Painless Technical Speaking*—Learn the "dos and don'ts" of giving technical presentations.
T-1101—*Practical Technical Calculations Made Easy*—Excellent reference, offers basic definitions/calculations.
T-1102—*Tap to TV: Strengthening the Weakest Link*—Addresses the installer's function and career.
T-1103—*Fiber Optic Trunk Restoration*—Explore typical fiber faults and learn temporary and permanent repairs.
T-1104—*Signal Leakage Issues One Year After Form 320*—A valuable update on CLI and the new role of EBS.
T-1105—*A Look Back - The Birth of Broadband Communications*—How our industry started and developed.
T-1106—*Exploring Fiber Optic Architectures*—Uses, performance and future applications of fiber are discussed.
T-1107—*Interdiction and Other Signal Security Techniques*—The latest methods of battling theft of service.
T-1108—*A Look Ahead- The Future of Broadband Communications*—The evolution of CATV; new services.

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. All SCTE videotapes are in color and are available in the 1/2" VHS format only. Videotapes are available in stock and will be delivered approximately three weeks after receipt of order with full payment. Videotapes are shipped UPS. SCTE accepts MasterCard and Visa. NO CASH REFUNDS.

Mail To: SCTE
669 Exton Commons
Exton, PA 19341
or FAX with credit card information to: (215) 363-5898

Ship To: (Name)____________________

Address:____________________

Street address for UPS delivery - NO P.O. BOXES:

Phone #: (_____)________ Date: ________

Please send me the following tapes at $45 each: ☐ T-1098
☐ T-1099 ☐ T-1100 ☐ T-1101 ☐ T-1102 ☐ T-1103
☐ T-1104 ☐ T-1105 ☐ T-1106 ☐ T-1107 ☐ T-1108

SAVE $$$! CABLE-TEC EXPO 91 PACKAGE
(includes T-1098 to T-1108 plus proceedings manual, pen and pin)
#_______ sets at $350.00 each = $_______ (member price)

A check or money order for the appropriate amount shown above and made payable to the Society of Cable Television Engineers is attached.
I wish to pay by credit card. ☐ Master Card ☐ VISA
(Please check one)

Account Number:________________ Card Expires:____/____

Signature:________________________

Find that fiber!

(Continued from page 32)

rate of force applied by the technician is not controlled.

Self-testing and diagnostics. Contamination, especially in the outdoor elements, is a distinct problem with any test set that does not contain some type of self-testing and diagnostic program that ensures that the equipment itself is operating properly, and that the signal detector device is free of contamination.

Minimizing misidentification

As usage of CATV fiber systems becomes more prevalent, it is evident that a more sensitive identifier is needed. Such a fiber identifier would eliminate the potential for failure of technicians to identify light fibers and contain several features to help alleviate the most common reasons for misidentification. The following are among them:

- A signal level sensitivity of 50 dBm to pick up low-level signals on a live fiber, especially in trunking systems.
- Tone detection capability of 1 kHz and 2 kHz and transmission direction indicators.
- The capability to operate over 1,310 nm to 1,550 nm with low insertion loss at 1,300 nm and 1,500 nm.

Since the rate of force applied to fibers during the identification process can vary from technician to technician, a bidirectional mechanical damping device that automatically controls the rate and amount of force applied to the fiber would be built in.

To ensure that the unit operates properly during each use and is free of contaminants that could distort readings, some sort of self-testing procedure is required in the software before and after each fiber insertion. These self-tests should check the optical channel in which the fiber is inserted.

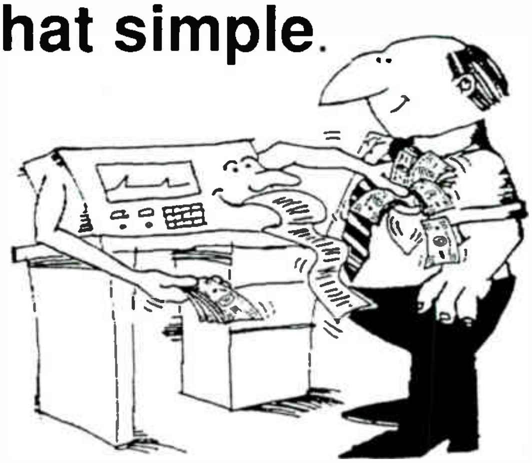
To minimize confusion for the technician, the identifier operation should be kept as simple and straightforward as possible. Pertinent messages — such as indicators for low batteries, signal direction and no signal detection — should be displayed on an LED panel to simplify the identification process for technicians. The identifier should be lightweight and portable and built for the rugged and harsh field environment with weather-protected, self-contained operation. It should operate on a standard, readily available 9-volt battery.

Reader Service Number 43

RiserBond TDRs

are the best way to save you TIME and MONEY when locating faults or measuring cable.

It's that simple.



- Rugged, Compact and Lightweight
- Automatic Distance and Return Loss Readings
- High Precision Accuracy (+/-.01%)
- Built-in Printer and Rechargeable NiCad Batteries Standard
- Waveform Storage and Comparison Standard

NEW

Model 1220
$5195.00

MTDR-Cable Fault Locator

RiserBond INSTRUMENTS™
5101 N. 57th Street
Lincoln, Nebraska 68507

TOLL FREE ASSISTANCE
1-800-688-8377

As more and more optical fiber goes into service, the need to accurately identify and test individual fibers within systems is escalating. Fibers are carrying so much video — one fiber can carry 54 broadband channels — that it can cost many thousands of dollars if a fiber is shut down in error.

Summary

The complexity of fiber-optic systems has increased. Now, in order to maximize the transmission capability of fiber-optic technology, cable companies are designing elaborate infrastructures with multiple hubs and routes containing up to 144 individual fibers.

While much of the identification and test equipment developed in the late 1980s helped cable technicians in their work identifying and testing fiber, there were still some shortcomings that led to misidentification. As the science of optical fiber identification and testing advances, new features are being designed into test equipment that help technicians overcome many of the critical factors involved in identifying and analyzing optical fibers. **CT**

"OUR GOAL...TO M STAND-ALO SYSTEM USI TECHNOLO

Jerry Neal
Senior Software Engineer
Pioneer Communications of America
Cable Systems Division

When Pioneer developed the Pioneer LaserDisc Universal System (PLUS), our goal was to simplify operations and increase revenue for the cable operator. We know that system automation and increased customer programming selection are both good economic moves.

So, we created PLUS to provide pre-programmed, uninterrupted entertainment. PLUS can control multiple pay-per-view channels of laserdisc players or autochangers. Laser technology translates into a durable maintenance-free, high quality video and audio program source. PLUS is backed by the reliability of Pioneer technology.

Because your business demands performance...

PIONEER COMMUNICATIONS OF AMERICA, INC. *CABLE SYSTEMS DIVISION*
600 East Crescent Ave. • Upper Saddle River, NJ 07458 • (201) 327-6400 • Outside New Jersey (800) 421-6450

AKE A VERSATILE NE PAY-PER-VIEW NG LASERDISC GY.”

LD-V8000 LaserDisc Player—single sided disc player for blockbuster movies and reliable 24-hour operation.

LC-V330 Autochanger—72 disc capacity for a diverse selection of movies or as an on-line backup for single LD players.

PLUS Controller—IBM AT/Compatible for flexible movie definition and scheduling, allowing control of multiple pay-per-view channels using laserdisc-based technology.

Visit us at booth #2470 during the NCTA Show.

Reader Service Number 44

PIONEER®

© 1992 Pioneer Communications of America, Inc.

ADVERTISEMENT

REVOLUTIONIZING TELEVISION AUTOMATION

Real-Time Control Solutions for Small Systems

By John Gerstenberg
Systems Engineer

Situation

Small cable systems are looking for a cost-effective and integrated approach to real-time automated control of a host of different devices, including VCR's, audio/video switchers, IF/RF switchers, satellite receivers, and more.

Objective

Provide a capable, yet low-cost clock controller that is modular in design, for use in a variety of control applications.

Solutions

For less than $1000, cable operators can buy the Li'l Ben, a basic seven-day clock controller with eight programmable outputs, capable of controlling up to 400 events. (Other optional configurations cost a little more.)

The Li'l Ben™ Clock Controller from Channelmatic is designed as an all-purpose clock for small cable systems, which means it does just about anything, but costs next to nothing.

Many Configuration Options

This versatile, microcomputer-controlled device can be configured in many different ways, simply by adding custom control modules internally, or by controlling the same modules in an external chassis. In its basic form (LCC-1A), the Li'l Ben has eight open-collector, FET "pull to ground" outputs, through which it performs direct VCR control, A/V switching, or virtually any custom control in real-time.

A slightly different version of the Li'l Ben (LCC-2A) uses Single-Pole, Double-Throw relays. As illustrated in Figure 1, the LCC-2A is used to control an external channel modulator with a built-in A/B switch, to select one of two program sources for that channel.

The LCC-3A has a 2x1 stereo audio-follow-video switcher actually built-in, for switching between any two A/V sources, such as VCR's, networks, or character generators. Two of the control outputs are internally wired to control the audio/video switching, leaving six FET outputs to control other external devices. Incorporating the switcher in the Li'l Ben saves the operator money and valuable rack space.

The LCC-5A was developed to work in conjunction with sequential ad insertion systems to provide limited fixed-position insertion capability, as shown in Figure 2. By automatically rewinding the VCR to the beginning of its tape at a scheduled time, the Li'l Ben allows the ad insertion system to recue the VCR to the first commercial on the tape. Unique software logic enables the LCC-5A to monitor the on-air line from the ad insertion controller, and rewind the VCR only when a commercial is not actively being inserted.

Ease of Operation

Programming the Li'l Ben is as easy as setting a digital wristwatch. Instructions are keyed in with a four-button keypad. A four-digit multiplexed LED display guides the user through the various modes of operation, and also displays output circuit status.

Custom Solutions

The real-time control applications discussed here are only a few of the typical uses for the versatile Li'l Ben Clock Controller. In combination with Channelmatic's extensive line of 3000-Series function modules, the possibilities of low-cost, real-time automated control are limited only by your imagination.

Channelmatic designs, manufactures and installs complete automation systems that improve operating efficiency and on-air signal quality. With a complete line of over 200 modular units and A/V accessories, we can enhance your system with virtually any feature you could want or need.

Call, write or FAX us today with your automation needs, and let us find a solution. You could be featured in our next article.

Figure 1.
Li'l Ben controlling an external channel modulator

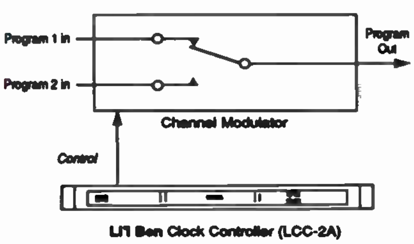
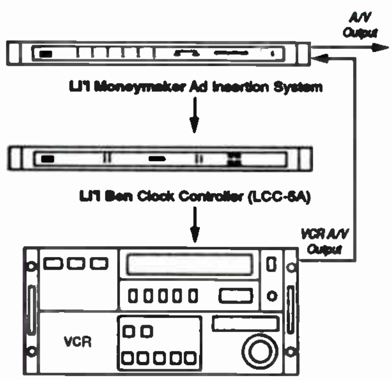


Figure 2.
Li'l Ben with Sequential Ad Insertion System



CHANNELMATIC

821 Tavern Road, Dept. CT2
Alpine, California 91901
(619) 445-2691 • (800) 766-7171
FAX (619) 445-3293

May 1992

Safety spotlight

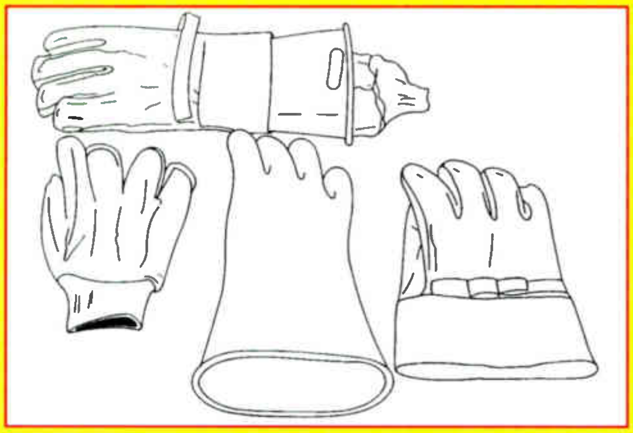
BACK TO BASICS

The training and educational supplement to Communications Technology magazine.

Geri Saye

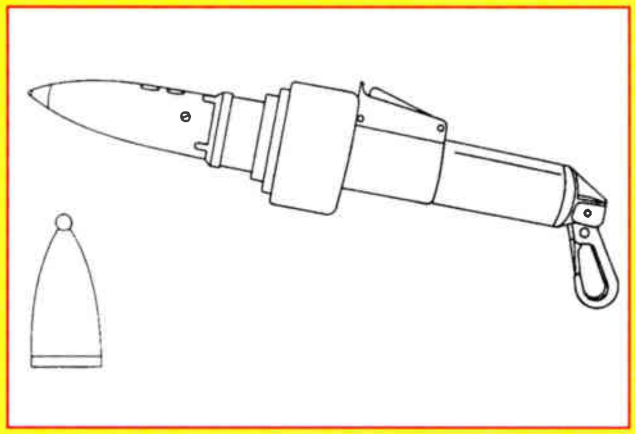
Table of Contents

Figure 1: High-voltage gloves (with protector gloves and inner liners)



Courtesy of Mind Extension Institute, *General Safety* interactive video

Figure 2: Voltage detector



Courtesy of Mind Extension Institute, *General Safety* interactive video

Power awareness: Hot gloves and voltage detectors

Based upon careful interpretation of the "Code of Federal Regulations Title 29" Part 1910.268, it is the position of this author that all associates who climb poles or work where there is danger of contact with power need to be issued high-voltage gloves and voltage detectors.

This article will review the thought process behind this decision, outline recommendations for when and how to use high-voltage gloves and voltage detectors, and touch upon training and follow-up guidelines.

By Pam Nobles
Senior Staff Engineer/Technical Training
Jones Intercable Inc.

High-voltage gloves and voltage detectors have been a source of controversy and confusion in cable TV systems for years. This primarily is due to the diverse interpretation of the codes and the fact that there are no direct regulations for CATV in the codes. In addition, issuing high-voltage gloves and detectors opens up a "can of worms" involving inspection and testing of the equipment, training of the associates, and follow-up on both.

Many managers don't want to deal with these issues — especially, since the misuse of such equipment may cause injury or death. Unfortunately, not using this protective equipment at all could cause the same result.

Quite frankly, discussions on high-voltage gloves and voltage detectors at times can become very emotional! Different system offices of the same company are quite often divided in their interpretations of *if* or *when* this protective gear should be used.

Thought process behind decision

Guidelines for when high-voltage gloves and voltage testers should be used are found in the "Telecommunications" section of *CFR Title 29*, Part 1910.268. The individual paragraphs that refer to our topic have been reproduced in this article for your reference. (See accompanying table on page 66.) It is important for you to secure an entire copy of this code for your own reference.

The first test a lineman makes is to determine if the pole is climbable. When climbing a joint-use or light fixture pole, a visual check is made of condition and rake of the pole, and whether or not the metal power conduit, exposed vertical power ground wires, or street light fixtures are bonded to the communications strand or cable sheath. If grounding cannot be determined visually, the code states that these items shall be tested for voltage. The code continues in (ii): "If no hazardous voltage is shown by the voltage test, a temporary bond shall be placed between such street light fixture, exposed vertical power grounding conductor, or metallic power conduit and the communications cable strand."

In (5), we learn how to attach and remove temporary bonds: "When attaching grounds (bonds), the first attachment shall be made to the protective ground. When removing bonds, the connection to the line or equipment shall be removed first. Insulating

CableWorks

Remote Order Processor

We integrated an ARU, Addressable Interface, and our PC/LAN based billing software and came up with the most cost effective Pay-Per-View event processor available today.

Then, we made it talk to other billing systems.

If you need to authorize Pay-Per-View events at remote Apartment Complexes, Trailer Parks, Universities, or Hospitals YOU NEED our

Remote Order Processor.

For Info Contact

Computer Utilities
(800) 541-8825
(501) 741-1616
See us in Dallas at booth 1137.

Reader Servicer Number 46

Most injuries aren't from falling off a ladder.

Unfortunately, they occur when technicians struggle to load or unload ladders from old-fashioned, roof-top carriers.

Fortunately, Crown has designed a product that can help prevent those twisted ankles, banged up knees and pulled back muscles. It's the Slide-Down™ Ladder Rack, widely acclaimed by both safety personnel and on-the-job employees.

Popular with small and big fleets alike, the Slide-Down™ Ladder Rack puts the ladder "Within Arms Reach™"... enabling the ladder to slide from roof top to the side of the van for sure-footed ease of loading and unloading. It goes back up just as easily!

For information on the Slide-Down™ Ladder Rack and Crown's full line up of interior products, call toll free: **1-800-321-4934** (In Ohio: **1-800-525-2485**).

CROWN

THE CROWN DIVISIONS
of THE ALLEN GROUP INC.
1654 Old Mansfield Road
Wooster, Ohio 44691

gloves shall be worn during these operations."

In addition, we learned in (4) there are specific requirements that deal with "suitable protective grounding" that the communications cable sheath or shield must meet:

"(A) Bonded to an underground or buried cable that is connected to a central office ground, or

(B) Bonded to an underground metallic piping system, or

(C) Bonded to a power system multigrounded neutral or grounded neutral of a power secondary system that has at least three services connected."

After the lineman has completed all these visual checks, if he can't be completely sure the line is bonded, testing for voltage and wearing high-voltage gloves is necessary.

Gloves use

High-voltage or rubber-insulated safety gloves (Figure 1 on page 60) are worn to prevent injury in the event of an accidental encounter with electricity. It is very important to note that wearing hot gloves does not mean you can intentionally grab a hot wire. Good work practices and safe procedures will protect you from electricity. In all cases, avoid hot wires and energized surfaces.

"Wearing hot gloves does not mean you can intentionally grab a hot wire."

For use in CATV, 10,000 volt gloves are recommended. Always wear rubber-insulated safety gloves when:

- There is a possibility of contacting electrical power,
- Placing and removing temporary and permanent electrical bonds,
- Installing a ground rod, and/or
- When using a voltage detector.

American Standard Test and Measurement (ASTM) Designation F 496-85 — Standards on Electrical Protective Equipment for Workers, provides the specification for the in-service care of insulating gloves. The following guidelines have been extracted from this standard.

Inspections and tests

The field care and inspection of electrical insulating gloves, performed by the individual, is an important requirement in providing protection from electric shock. Defective or suspected defective gloves shall not be used.

Insulating gloves shall be visually inspected by the wearer for defects when initially received, and before and after each use. Gloves shall be air-tested before use each day and at other times if there is cause to suspect any damage. They shall be inspected over the entire surface and shall be rolled gently between the hands to expose defects and imbedded materials.

Insulating gloves shall be given an air-test by rolling the cuff tightly toward the palm in such a manner that air is entrapped inside the glove, or by using a mechanical inflator. When using the latter, care shall be taken to avoid over-inflation. The glove shall be examined for punctures and other defects. Puncture detection may be enhanced by listening for escaping air or holding the gloves against the worker's cheek to feel for escaping air.

A visual inspection of gloves shall be made in the field monthly by a designated person to determine that such equipment is being maintained in a satisfactory condition by the tech.

Follow this inspection sequence:

1) Visually check return for test

DH

" THE SPUN ANTENNA PEOPLE "

- WORLDWIDE SHIPPING -

- ANTENNAS 60 CM THRU 5 M -

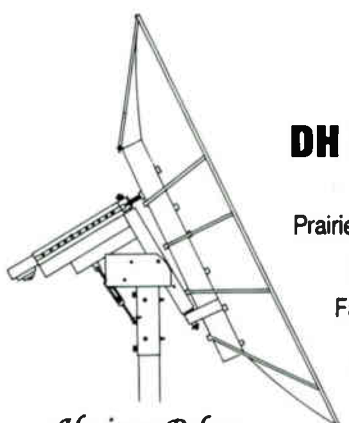
Our reputation was built by excellent reception in Ku fringe areas.

Over 10 different mounts for over 17 different size antennas are available.

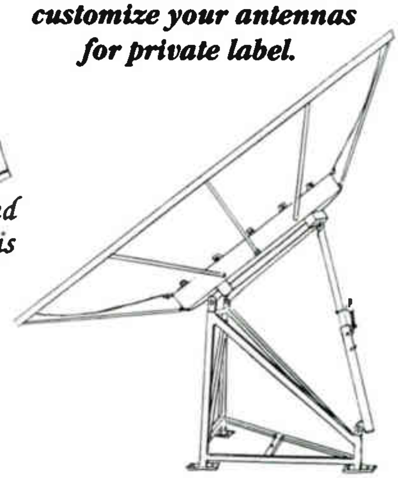
DH offers different focal lengths, and different edge designs to customize your antennas for private label.

All DH Antennas are spun aluminum and continually checked for repeat accuracy & high efficiency.

Motorized Dual Axis



Horizon Polar



3 pt. SSE AZ/EL Mount

Gibralter Mount

DH SATELLITE INC.

P.O. Box 239

Prairie du Chien, WI 53821 U.S.A.

Phone (608) 326-8406

Fascimile (608) 326-4233

CALL, WRITE OR FAX FOR INFORMATION

Bandsplitters For Cable Headends & Fiber Optic Splits

Cable Headend Bandsplitters - 3329 Series

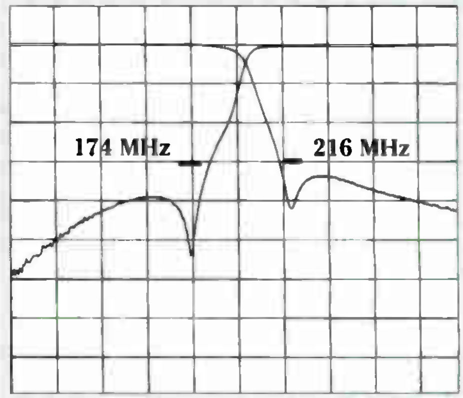
A bandsplitter separates the entire RF spectrum into a low band and a highband. It can also be used to combine these high and low bands to a common output.

Splitters are AC/DC passing on the low band side only. Passband loss is approximately 1 dB, except at band edges nearest the crossover frequency, where it is approximately 3 dB.

Model	Passband(MHz) Low	Passband(MHz) High	Mutual Isolation	Functional Use
3329-VB*	0 - 4.2	4.5 - 25	25 dB	TV baseband video/audio
3329-57*	0 - 45.75	60 - 300	45 dB	Sub-band/VHF
3329-51.5(25)	0 - 48	54 - 450	25 dB	Sub-band/VHF
3329-51.5(40)*	0 - 48	54 - 450	40 dB	Sub-band/VHF
3329-38	5 - 33	54 - 500	25 dB	Sub/low VHF
3329-98	5 - 88	108 - 300	25 dB	Low VHF/Mid-band
3329-130	5 - 110	170 - 450	30 dB	Low/high VHF
3329-M/S	5 - 174	216 - 420	30 dB	Mid-band/Super-band
3329-375	54 - 300	470 - 890	25 dB	UHF/VHF

Baseplate dimensions: 2 1/4" x 6 1/8"

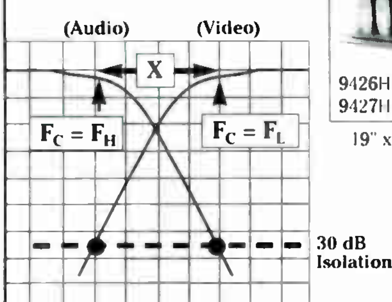
Series 3329 broadband cable bandsplitters includes a model for almost any normal CATV or LAN application and reflect a design capability spanning baseband (4.2 MHz) to UHF (890 MHz). We will quote promptly to your specifications for additional models for your special system or application.

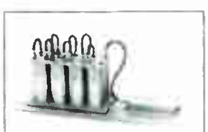


3329-(M/S) Frequency Response

Fiber Optic Filters

For Supertrunk Noise Reduction & Dual Laser Distribution





9426H
9427H

19" x 5" Rack Panel

9428

2 1/4" x 6" x 1"

3329-(M/S)

(Baseplate dimensions: 1 1/2" x 4")

9429

2 1/4" x 6" x 4"

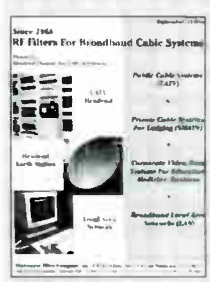
These extremely selective low pass filters, high pass filters and bandsplitters employ Hi-Q mechanical cavities or elliptical function techniques in their design.

Fiber Optic Splitters

Type	Cut-Off	Type	Cut-Off Option	Loss dB F_H	Loss dB F_L	(MHz) X	(dB) RL	(ns) Delay
Low Pass	Adjacent	9426L-(F_H)	54 – 300	< 3	—	1.5	> 8	≈ 50ns
Low Pass	Adjacent	9426H-(F_H)	300 – 550	< 3	—	1.5	> 8	≈ 50ns
High Pass	Adjacent	9427L-(F_L)	54 – 300	—	< 3	1.5	> 8	≈ 50ns
High Pass	Adjacent	9427H-(F_L)	300 – 550	—	< 3	1.5	> 8	≈ 50ns
Splitter	Semi adjacent	9428-F_H/F_L	54 – 300	< 3	< 3	7.5	> 12	≈ 20ns
*Splitter	Adjacent	9429-F_H/F_L	54 – 300	< 5	< 5	1.5	> 12	≈ 50ns

*PRODUCT UNDER DEVELOPMENT
Customer to specify F_L, F_H or F_H/F_L.

For details on general and fiber optic splitters and filters - Ask for free catalog C/91.



Bandpass Filters
- Channel BPF Standard Adjacent Cut-Off
- FM Channel Isolation Full Band
- Pole Mountable Pay-TV
- CARS Band Waveguide
- Carrier Isolation System Noise Test Leakage Sniffer
- Wideband:
  Low VHF Band
  Midband
  Hi VHF Band

Microwave Filter Company, Inc. • 6743 Kinne Street • East Syracuse, NY 13057

Toll Free (USA/Canada): 1-800-448-1666 • Collect (NY/HI/AK): 315-437-3953 • FAX: 315-463-1467, 315-463-0681

See us at the SCTE Show, Booth 147. Reader Service Number 50

NEW NCTA STANDARDS CALL FOR PROOF OF PERFORMANCE TESTING...

LET US TEST FOR YOU!

- Sweep, Balance and Proof of Performance
- Fiber Optics
- Electronic Upgrades
- Electronic Testing of Cable Systems and LAN's
- Retro-Fit Systems
- Technical Evaluations

The Proof is in Our Performance.

System Performance Engineering, Inc.

(904) 262-8269
FAX (904) 260-0383

PO Box 24927,
Jacksonville, FL 32217

We are fully equipped to perform all services for CATV and LAN operators related to electronics.

Reader Service Number 51

date. If out of date do not use and return for test.

2) Pull vigorously between fingers looking for cracks and inner liner, normally a contrasting color, showing through.

3) Look for signs of abrasions or deterioration on the palms, back of the thumb side and little finger side.

4) Turn the glove inside out and repeat the stretch test.

5) Turn the glove right side out.

6) Squeeze the fingers of the glove together and let go quickly. Live rubber will return to normal.

7) Fill the glove with air by revolving the glove around the edge of the gauntlet axis, rolling it toward the palm and fingers.

If insulating gloves fail any of these tests, do not use.

In addition to the daily and monthly inspections done at the system, high-voltage gloves should be checked with voltage every nine months. According to ASTM Designation F 496-85, since the telecommunications industry utilizes insulating gloves as precautionary protection against unintentional contact with energized conductors, the maximum interval between issue and retest is nine months. *CFR Title 29* Part 1910.268 indicates 12 months for new gloves. Gloves can be voltage tested by your local power company or by a testing lab for their ability to insulate against voltage. Tests should be identified as indicated under record keeping.

The following are more tips for keeping gloves in good working order:

1) *Storage* — Gloves shall be stored in a location as cool, dark and dry as possible, free from damaging substances, vapors and fumes, and away from electrical discharges and sunlight. Gloves shall be stored in their natural shape, with fingers up, so debris does not fall in the gloves. Gloves may be kept inside of protectors or in a bag, box or container that is designed for and used exclusively for them. Gloves shall not be stored folded, creased, inside out, compressed, or in any manner that will cause stretching or compression. Hang the storage bag in a protected location that visible to tech.

2) *Care* — Gloves shall be wiped clean of any oil, grease or other damaging substances as soon as practicable. Gloves should be rinsed as necessary to remove perspiration. Excess water should be shaken out and then the gloves should be air-dried. Never patch or repair rubber-insulated gloves in any way.

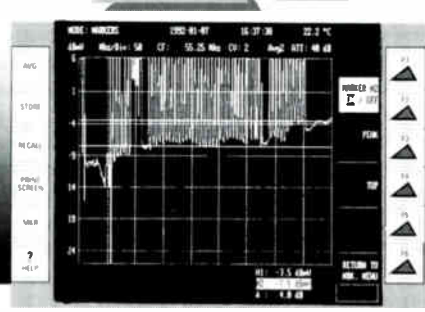
Carelessness causes the following glove damages:

- Snags (caused by not wearing protective leather gloves over the hot gloves)
- Ozone (caused by storage near ozone-producing equipment)
- Chemical attack (swelling caused by oils and petroleum compounds)
- Sun checking (caused by prolonged exposure to sunlight)
- Cracking (caused by prolonged folding of gloves — the strain on the rubber at the folded point is equal to stretching the glove to twice its length)

3) *Protector gloves* — The protector gloves shall meet Specification F 696 and shall be worn over insulating gloves to prevent mechanical damage. ASTM Specification F 696 describes the type and thickness of the leather for the gloves as well as the material for the cuffs. The protector glove shall be sized and shaped so that the insulating glove shall not be deformed from its natural shape.

The minimum distance between the top of the cuff of the protector glove and the rolled top of the cuff of the in-

REMEMBER WHAT THEY USED TO SAY ABOUT LOW-LEVEL SYSTEM SWEEPING?



Today the *NEW* AVANTRON *Sweep/Analyzer System*
uses advanced digital circuitry to provide you with HIGH LEVEL results.

NON-INTERFERING, NON-DELAY
continuous "Real Time" sweeping, High Resolution CRT Display, no matter how long your cascade is.

For more information contact :
AVANTRON COMMUNICATIONS INC.
8596 Pie IX Blvd. Montreal, Qc. Canada HIZ 4G2 Fax: (514) 725-5637 **(514) 725-6652**

Reader Servicer Number 52

AT QRF

PRICE SPEAKS LOUDER THAN WORDS

♦ HYBRID SPECIALS ♦

ALL HYBRIDS ARE TESTED AND DOCUMENTED

♦ BUY NOW! ♦

PRICES WILL NEVER BE LOWER

NEW  NEW

TYPE	GAIN	BANDWIDTH	
PHA4518-11	18dB	450MHz	19.00
PHA4518-12	18dB	450MHz	19.00
PHA5518-12	18dB	550MHZ	20.00

AS LOW AS $18.00

MHW 6181	18dB	40-550MHz	26.50
MHW 6182	18dB	40-550MHz	27.50
CA 4101	17dB	40-400MHz	18.00
CA 2422	22dB	5-120MHz	20.00
CA 2201R	17dB	40-300MHz	24.00
CA 2301R	22dB	40-300MHz	25.00
CA 2418R	17dB	5-120MHz	22.00
BGD 102	18.5dB	40-450MHz	30.00
BGD 104	20dB	40-450MHz	36.00

(BGD102 and BGD104 are power-doubled)

LOWEST PRICES EVER IN OUR 10 YEAR HISTORY!

Quality RF Services, Inc. tests every hybrid for gain, second order, composite triple beat, cross modulation and current consumption. We will also record the worst case readings.

Any order placed by 3:00 PM (EST) will be shipped the very same day.

At QRF we strive to make sure that you – our valued customers get:
TOP QUALITY • LOW PRICES • FAST SERVICE
From the most comprehensive line-up of products and services available anywhere in the CATV industry.

With confidence in our products, money back guarantee, experienced personnel and a proven track record, why would you settle for less?
WHEN ONLY EXCELLENCE WILL DO!!!

QUALITY RF SERVICES, INC.
850 PARKWAY • JUPITER, FL 33477

COMPONENTS • PRODUCTS
TECHNOLOGY • SERVICE

(800) 327-9767 FAX (407) 744-4618

Reader Service Number 53

CT 5/92

System Name ____________________
Address ____________________
City/State ____________________ Zip ________
Telephone ____________________
Your Name ____________________ Position ________
Equipment Used in System ____________________

Please:

- ☐ Send Replacement Components Catalog.
- ☐ Send information on repair service.
- ☐ Send information on Circuit Boards to increase your channel capacity.

Reader Servicer Number 54

AD SYSTEMS

DON'T WAIT...

With our P.C. based platform you are protected no matter how the technology changes!

- PC•POWER
- PC•FLEXIBILITY
- PC•RELIABILITY
- PC•VALUE

Let us offer it all:
ROS, Random,
Sequential,
Spot Random,
Compiling,
3/4,
3/4 SP,
SVHS,
laser,
and
upgradable to Digital.

AD SALES PROFITS TODAY & TOMORROW

801.263.1661
801.266.8813 *(fax)*

CFR Title 29, Telecommunications, Ch. XVII (7/1/91 Edition)

(m) Grounding for employee protection-pole lines

(1) *Power conductors.* Electric power conductors and equipment shall be considered as energized unless the employee can visually determine that they are bonded to one of the grounds listed in paragraph (m)(4) of this section.

(2) Nonworking open wire. Nonworking open wire communications lines shall be bonded to one of the grounds listed in paragraph (m)(4) of this section.

(3) *Vertical power conduit, power ground wires and street light fixtures.*

(i) Metal power conduit on joint-use poles, exposed vertical power ground wires, and street light fixtures which are below communications attachments or less than 20 inches above these attachments, shall be tested for voltage unless the employee can visually determine that they are bonded to the communications suspension strand or cable sheath.

(ii) If no hazardous voltage is shown by the voltage test, a temporary bond shall be placed between such street light fixture, exposed vertical power grounding conductor, or metallic power conduit and the communications cable strand. Temporary bonds used for this purpose shall have sufficient conductivity to carry at least 500 amperes for a period of one second without fusing.

(4) Suitable protective grounding. Acceptable grounds for protective grounding are as follows:

(i) A vertical ground wire that has been tested, found safe and is connected to a power system multigrounded neutral or the grounded neutral of a power secondary system where there are at least three services connected;

(ii) Communications cable sheath or shield and its supporting strand where the sheath or shield is:

(A) Bonded to an underground or buried cable which is connected to a central office ground, or

(B) Bonded to a underground metallic piping system, or

(C) Bonded to a power system multigrounded neutral or grounded neutral of a power secondary system which has at least three services connected;

(5) Attaching and removing temporary bonds. When attaching grounds (bonds) m, the first attachment shall be made to the protective ground. When removing bonds, the connection to the line or equipment shall be removed first. Insulating gloves shall be worn during these operations.

(n) Overhead lines.

(1) *Handling suspension strand.*

(i) The employer shall insure that when handling cable suspension strand which is being installed on poles carrying exposed energized power conductors, employees shall wear insulating gloves and shall avoid body contact with the strand until after it has been tensioned, dead-ended and permanently grounded.

sulating glove shall be not less than 1 inch for a Class 1 glove.

Protector gloves that have been used for any other purpose shall not be used to protect insulating gloves. Supplying protectors with bright color gantlets may guard against this problem, since an inspector can see the gloves in use from a distance. Protector gloves shall not be used if they have holes, tears or other defects that affect their ability to give mechanical protection to the insulating gloves. Keep protector gloves as free as possible from oils, greases, chemicals and other materials that may injure the insulating gloves. If contaminated, do not use unless they have been thoroughly cleansed of the contaminating substance. The inner surface of the protector gloves should be inspected for sharp or pointed objects. This inspection should be made as often as the rubber gloves are inspected.

Cloth gloves may be worn inside of insulating gloves for warmth in cold weather and to absorb perspiration in hot weather.

Gloves with any of the following defects shall not be used and shall be returned to an electrical testing facility for inspection and electrical retest:

- Holes, tears, punctures or cuts;
- Ozone cutting or ozone checking;
- Imbedded foreign objects;
- Texture changes (swelling, softening, hardening, becoming sticky or inelastic); and/or
- Other defects that damage the insulating properties.

Gloves that have been rejected and are not suitable for electrical service shall be defaced, cut or otherwise marked and identified to indicate that they are not to be used for electrical service.

Record keeping and marking

Gloves shall be marked to identify the type, class and size. The test procedures of the electrical test facility shall specify the test voltage for each class of glove to be tested or a record shall be kept of the voltage used in the test. A date specified as test or retest shall be either recorded or provided by marking or affixing a label to the glove. The marking or labeling method and material shall not adversely affect the electrical or physical characteristics of the glove or sleeve or conflict with the manufacturer's original marking or labeling. Employees should inform their supervisor if inspection date is past due.

Voltage detector use

The voltage detector (Figure 2 on page 60) is included in this discussion since its purpose is similar to that of high-voltage gloves — that is, to prevent injury in the event of an accidental encounter with electricity. In addition, high-voltage gloves must be worn during most applications of the voltage tester. Much of the information in this section has been summarized from the *C-9970 Voltage Detector Handbook*. Since voltage detectors vary, it is important to understand the theory and operation of the particular test set your company uses.

The voltage detector is a high-voltage detection device. It is intended for use in testing various conductive objects such as power ground wires, street light fixtures, mobile homes, metal frameworks, metal conduit, pedestals, newly driven ground rods, homes covered with metallic siding, electrical machinery and similar items that a tech may contact.

The C-9970 voltage detector uses electronics and high-voltage mechanical design to indicate the presence of dangerously high AC and DC voltages. The voltage detector does this by comparing the voltage difference between the user's body and the object being tested to an internal (to the voltage detector) safety reference. If the voltage difference exceeds this reference, the voltage detector will indicate danger by way of a flashing red LED.

The capacitance between the handle of the voltage detector and the user's hand is part of the measuring circuit and can affect the sensitivity of the voltage detector. Thus the final test using the voltage detector *must* be done with the bare hand holding the test set. However, the voltage tester should first be used while wearing high-voltage gloves.

Electrical testing is required on the following:

- Whenever there is reason to suspect damage to any utility;
- Uninsulated vertical grounds, electrical power guys, and conduits;
- Street light fixtures (ungrounded);
- Metal-sided buildings, mobile homes and trailers, aluminum siding;
- Joint-use pedestals;

window Lite™

At last, a full-function hand-held signal level meter.

This is the one you've been waiting for. Only new WindowLite™ gives you full spectrum awareness, advanced technology, ease of use and reliability... in an affordable hand-held field diagnostic device.

Lite in weight. Heavy on performance.

WindowLite lets you examine your system at any level of detail. Its high-resolution LCD shows bar graphs of amplitude and digital display of hum and carrier-to-noise.

Because it's a full spectrum display, you can see all channels in the range of 5 to 860 MHz at once without the need for band selectors. Or use the numeric keypad to directly access a single channel. You can even preset WindowLite to go right to favorite channels upon power-up.

WindowLite is auto-scaling and auto-ranging, eliminating the need for user-selected attenuator pads.

And it includes an internal noise source for precise calibration. Another WindowLite exclusive.

Lite on your budget.

Best of all, WindowLite costs less than larger, bulkier units that don't offer nearly as much. It's ruggedly constructed for use in the field. And we back it with our two-year parts and labor warranty.

A whole new Lite.

Call, write or fax us today for more information. It's time to see your system in a whole new light.

WindowLite.

ComSonics, Inc.
An Employee Owned Corporation

1350 Port Republic Road
Harrisonburg, Virginia 22801
Telephone 800-336-9681
or 703-434-5965
Telefax 703-434-9847

In Canada contact
Incospec Inc.
3150, Delaunay
Laval, Quebec H7L 9Z7
Telephone 514-686-0033
Telefax 514-688-7709

Contact ComSonics for information on European and Middle Eastern distributors.

"Window" is a registered trademark and "WindowLite" is a trademark of ComSonics, Inc.

Reader Servicer Number 46

FO troubleshooting

(Continued from page 53)

fiber to another to a complete replacement of a segment of cable. Table 4 (page 53) shows what you should have in your emergency restoration kit. Normally, temporary mechanical splices are installed to expedite the restoration of service. Develop and practice emergency restoration procedures. After service is restored, permanent repairs via a "hot cut" can be made. The speed of the restoration of service is essential in order to keep customers satisfied.

Conclusions

Develop and practice an emergency restoration plan before a problem occurs. Know where the necessary records, equipment, materials and personnel may be found to make the temporary repairs. Use a logical process of elimination to determine the failure. After determining which of the components has failed, quickly effect the repairs. The most important thing about emergency restoration is to restore service as quickly as possible using temporary repairs that permit a graceful transition to a permanent repair. **CT**

"NCTI's courses complement our in-house training, Installer Certification and BCT/E exams. Combined, they are an effective, cost-efficient technical training program."

– Rich Henkemeyer
Technical Trainer
Minnesota Region
Paragon Cable and
SCTE Region 6 Director

National Cable Television Institute
P.O. Box 27277
Denver, CO 80227
303-761-8554
Fax 761-8556

Helping develop cable professionals for more than 24 years!

Reader Servicer Number 56

• Foreign plant in our work space, including telephone, down guys, etc.; and/or

• Ceiling grids.

Inspection and testing

Before using the voltage detector, perform all inspections outlined by the manufacturer. To use, grasp the detector by the handle and depress the trigger with the thumb. A red flashing LED indicates a dangerous voltage; green indicates voltage is not present. After determining the area is safe for work, a temporary bond is placed as a precaution should a fault develop once work is underway.

The voltage detector must be visually inspected and tested:

• When received,

• Before each use (self-test),

• At least once a month (maintain a record), and

• Annually with appropriate test set.

Underground plant

Mobile homes, trailers, metal-sheath buildings, ground rods and electrical machinery all present a potential electrical hazard and always require testing. Test the siding and frame or both frames in the case of double-wide mobile homes before starting work. If a voltage is detected on these objects, the property owner should be notified for corrective action according to the your company's procedures. Do not contact the potential hazard until all hazardous voltage has been removed and the voltage detector indicates a safe condition.

When a pedestal closure used in joint-buried plant has been damaged or disturbed or a trouble condition involving power is suspected, any power company work should be performed first. After the power company has completed its work, the pedestal should be tested with the voltage detector before any bodily contact is made. Work should not be done on the plant until the power company has completed repairs. Additional precautions should be exercised during construction or in storm repair situations. Be sure you understand the operation of the voltage tester as well as your company's procedures before proceeding in such situations.

Aerial

Examine the pole for potential electrical hazards such as a vertical power ground wire, vertical metallic power

Introducing the first play-it-again SAM.

Meet new LINE SAM® from Wavetek.

The first signal level meter with "learn" and "repeat" modes for fully automated testing.

On cue, LINE SAM automatically runs a programmed sequence of tests—again and again. Saving you time—and money. You can even program for unattended, time-delayed testing.

Without missing a beat, the LINE SAM stores up to 80 sets of test point data for 100 channels. And downloads to a PC or printer for spectrum or tabular printout. Comparing amplifier specifications couldn't be easier or more accurate!

LINE SAM. Easy. Accurate. Cost-efficient. For field or headend testing, we're playing your song.

Call Wavetek today at 1-800-622-5515—in Indiana, 317-788-5965—and ask for LINE SAM. This could be the beginning of a beautiful friendship.

© 1991 Wavetek

See us at the NCTA Show, Booth 1004.
Reader Service Number 57

WAVETEK

WASHINGTON CABLE SUPPLY, INC.

We now stock **Regal!!!**
Splitters and Taps

We also carry a full line of equipment and accessories at competitive prices.
The products we stock include:

Gilbert • Jerrold
Comm/Scope • Belden
Tyton • Pico Macom • LRC
Klein • Bashlin • Aervoe

4600-D Boston Way
Lanham, MD 20706
FAX: (301) 577-5551

Call the company that makes a difference

1-800-888-0738

Reader Service Number 58

conduit, street light fixture, power company primary disconnect hardware, or other foreign metal objects. Metal power conduit on joint-use poles, exposed vertical power ground wires and street light fixtures that are below communications attachments (or less than 20 inches above these attachments) shall be tested for voltage unless the employee can visually determine that they are bonded to the communications suspension strand or cable sheath. Also, observe the pole and adjacent spans for such hazards as improper clearance from power conductors or equipment, dangling power wires, inadequate clearance on pole-to-pole guys from power wires or energized attachment, etc. If none of these are present, the pole may be climbed providing no other hazard is evident.

If a vertical power conduit or other power company hardware extends to the base of the pole, make a voltage test before climbing or working on the pole.

If the ground wire is broken, test the portion going up the pole unless the break exists above the cable space. Do not attempt to test a broken ground wire or fixture in the power company's space (40 inches or more above highest cable attachment). If a vertical power ground wire is present, make a voltage test of the wire before climbing or working on the pole.

If the voltage tester does not indicate a hazardous voltage, poles carrying vertical power ground wires may be climbed. Care should be exercised to avoid simultaneous contact between power ground wires and cable or guys since a small voltage may be present. This is recommended to avoid the possibility of a surprise shock, which might cause a fall from the pole.

In general, the tech should avoid unsecured objects, dangling wires, etc., which would tend to move if probed. Do not contact supply wires going to the fixture. If a temporary bond cannot be attached effectively, wear high-voltage gloves.

To test for potential electrical hazards follow these steps:

1) Make pre-use test,
2) Put on insulating gloves,
3) Depress switch and approach the object to be tested,
4) If the LED does not flash, do another test without insulating gloves,
5) If the red LED does not flash, the object is not energized, and
6) If the red LED flashes, move away. Notify your supervisor and identify the hazard for the public and other employees.

Voltage detector temporary bond

The temporary bond is used to temporarily ground a fixture, conduit or bare vertical ground wire that has been tested for and found to be free from a voltage potential while working aloft. Should a fault develop, the temporary bond will provide a direct path to ground for the foreign potential. The insulation on the bond may overheat and smoke, which should alert the lineman to descend the pole.

While using insulating gloves, attach the bond in the following manner: Attach the small clip of the temporary bond to the cable suspension strand in such a manner that it will not be in the way of work operations. Then attach the large clip of the bond wire to the fixture, conduit or bare vertical ground wire. Do not bond to a support bracket of multiple line wire or the suspension strand of isolated cable. Never attach to any street light wires or terminals to which the wires are attached or to a fixture that causes the red LED to flash.

The insulating gloves may be removed only after the temporary bond is in place, and then only if other protec-

It's A Money Maker
...and we can prove it!*

At our "Remote Control Supermarket" cable operators get...

- The best price
- The best quality
- The longest warranty
- The best selection (21 models and custom designs)
- * Major MSO endorsements

Want more?...
How about a free call?

1-800-382-2723

CONTEC™ INTERNATIONAL
THE LEADER IN CONVERTER TECHNOLOGY
1023 State Street, P.O. Box 739
Schenectady, NY 12301-0739
Phone: (518)382-8000 FAX: (518)382-8452

Reader Servicer Number 15

tion requirements permit. Leave the temporary bond in place until all work operations have been completed at this pole for the day.

If the bond starts smoking, put on insulating gloves and descend the pole immediately. Do not make any contact with the bond, the fixture or its wiring.

Upon completion of work operations on a pole, remove the temporary bond as follows:

1) Put on insulating gloves,

2) Remove the clip from the fixture, metallic conduit or bare vertical ground wire, then

3) Remove the other clip that was attached to the strand. If a spark is detected when removing the bond, descend the pole immediately.

Particular care must be taken when working near traffic light wiring or other wiring that may become energized momentarily. Voltage tests made during one part of a cycle may not be valid during another part.

To use the temporary bond,

1) Wear insulating gloves.

2) Connect the small clamp of the bond to a known ground source first,

3) Connect the large clamp of the bond to the fixture last,

4) Leave the temporary bond in place until all work operations have been completed,

5) While wearing insulating gloves, remove the large clamp from the fixture first, and then

6) Remove the small clamp from the ground last.

If the bond smokes:

1) Leave the bond in place and move away and do not touch,

2) Identify hazard for the public and other employees and do not leave hazard unguarded,

3) Notify your supervisor immediately, and

4) See that the responsible company owner is notified of the hazard.

Training and follow-up

Since the improper use of hot gloves could result in death, a properly developed training program, adequately implemented and monitored, is critical.

One of the most difficult tasks may be addressing the need for a change of attitude regarding hot gloves and ensuring support from management in each system. This involves backing from management — we need to make sure this is not taken lightly.

Once your company's guidelines have been established and you have secured agreement from management, your training program can be developed. It is important that your training be geared specifically for your company.

Decide in advance what type of disciplinary action should be taken if guidelines are not followed. Use an employee sign-off sheet to aid you in training and inspection. Once begun, ongoing training and monitoring is critical.

Be sure to read the codes before deciding your position on high-voltage gloves and voltage detectors. Also, discuss your plan for with your company's safety director before implementation of their use. **BTB**

References

1) *CFR Title 29*, Part 1910.268, "Telecommunications."

2) *ASTM Standards on Electrical Protective Equipment for Workers*, Seventh Edition 1988, ASTM Designation: F 496-85 and ASTM Designation: F 696-85.

3) *C-9970 Voltage Detector Handbook*.

4) US West Communications Safety Assurance System.

XDC Smartswitch

...the ultimate solution to your SIMULCAST and general VIDEO SWITCHING problems.

Unsurpassed functionality and reliability in a compact, rack mount unit with the following outstanding features:

...fast, low error, two button data entry
...hierarchal data entry menu system
...internal 5" high resolution monitor with graphics display
...switching resolution to the second
...day-of-the week, weekend, weekday, and special switches (reduces weekly programming requirement)
...full remote access via touch-tone phone with VOICE FEEDBACK
...complete event logging (to disk and/or printer)
...proven design
OPTIONS:
...bidirectional telecommunications via modem (better than being there!)
...switched TTL outputs, contact closures, fully shielded relay matrices (1x2 and up)
...automated clock synchronization to National Bureau of Standards
...broadcast feature (control of multiple head end units at the press of a button)

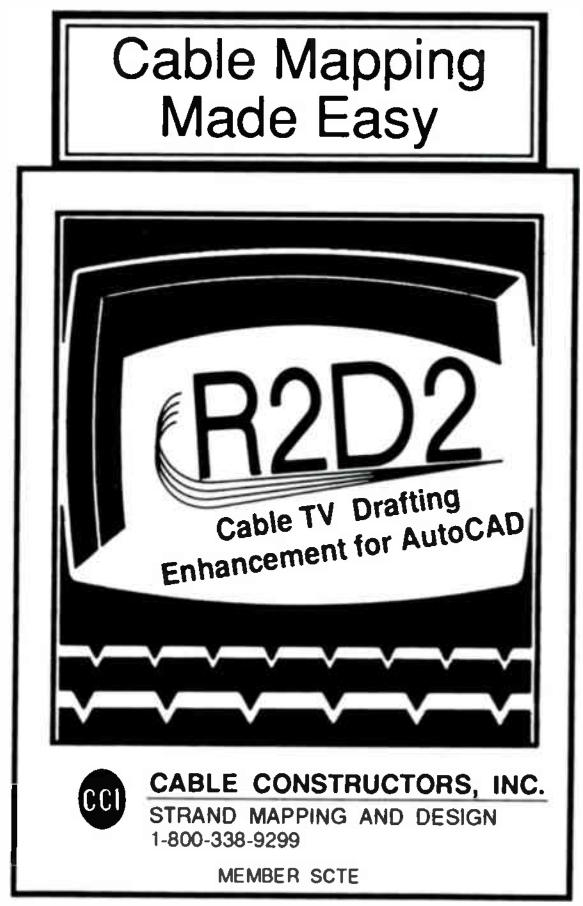
Complete systems from $9500.00 (8x8 matrix)

XON Digital Communications Ltd.

Now shipping: VER. 4.0

22 Waddell Ave., Dartmouth, Nova Scotia
B3B 1K3, CANADA
Ph: (902) 468-2755 FAX: (902) 468-2771

Reader Servicer Number 60



Reader Servicer Number 61

ECC '92
"OPEN FOR BUSINESS"

OLYMPIA, LONDON
19th, 20th, 21st October

European Cable Communications '92

For further information on stand availability please contact
Sharon Chapman
The Cable Television Association
Telephone (44) 71 222 2900
Fax (44) 71 799 1471

Reader Service Number 62

CABLE'S ONLY EUROPEAN CONVENTION

The bucket truck: A versatile tool (Part 4)

This is the fourth and last in a series of articles on bucket trucks and will cover "dos" and "don'ts." Part 1 (February 1991) explored their uses and benefits, Part 2 (March 1991) discussed maintenance and routine service, while Part 3 (July 1991) outlined equipment and accessories.

By Pat Bartol
Technical Representative, Mobile Lifts Inc.

The long open stretch of rural road shimmered in the late afternoon heat. Barely a tree in sight on the pole line for a good mile and a half and for the construction crew that spelled out dollar bills. There would be nothing to slow down or hinder lashing up a .750-inch trunk cable and a .500-inch feeder with it at maximum speed. When being paid by the foot, speed is essential in order to make good bucks. "Bonus time. Let 'er rip."

Well look at that would you! What the heck is Mike doing? Mike had just passed the lashing machine to the other side of the pole, made his loops and secured the lashing wire to the clamp and after placing the snap hooks from the pulling rope to the lashing machine so that the ground hands could pull the lasher, he is now bringing the bucket all the way down again to be moved to the next pole.

Neil Knowsitall

"Hey! Hey Mike, whatcha doin' man? C'mon dude, stay up there and I'll drive the truck to the next pole. You just hold on to the lasher rope and pull the machine from up there and we'll save some time and make more footage today." That of course was from Neil Knowsitall. He's the old hand on the crew who has been around a year or two now including a project down Texas or Arizona way (or so he says). It was something like a 10-mile extension — a real big project.

Neil knows a lot of shortcuts like not wasting too much time on rollers, "One to a span is plenty," says Neil. Neil also tells a story of the time he and one helper put up 5,000 feet of strand all by themselves including several corners. As Neil says, "Well shoot, it got a little tricky when we couldn't see the strand after the first bend or the #!&@*# trailer either. We just kept pulling off with the bucket truck until the strand tension got a little tight. That's when we went back to check the (ha ha ha) trailer and there it was (heh heh heh) halfway up the #%!&@# pole. Oh Geez, was that ever funny. The strand snagged on the reel and bound tight and pulled the whole #@%!*# shebang right up the pole." What he doesn't mention is that at the same time about three or four rural route mail boxes were now around 18 feet in the air as well.

I suppose you might be wondering about now what all this has to do with bucket trucks. Well, I'm getting to that. You see, what was happening here is that the guys who knew better were allowing themselves to be influenced by a guy who should have known better. The issue is simple. In order to speed things up, make better time or more money, sometimes people have a tendency to shortcut, which is not really shortcutting but more like gambling. They take a chance on the durability of equipment beyond the manufacturer's design specifications betting on the safety margins inherent in that equipment to allow them to get away with some very dumb things. They don't consider that someone could get hurt or that equipment could be abusively damaged, which could necessitate expensive repairs or long down time far beyond the small amount of time or money saved.

Don't risk it

The gears, hinge pins, bolts, mounts and hydraulics are designed in most cases to function with lifting a certain amount of weight, usually 300 pounds maximum, to a certain height at a certain angle and speed. This 300-pound maximum weight is generally regarded as a 180- to 200-pound man with his tools and test equipment or line equipment, such as a lashing machine. In the case of pulling the

The Original Cable Drop Marker Is Still The Best.

The Budco Taplock.

Budco invented the Taplock in 1970. Improved it in 1976, 1981, 1982, and 1986. And more Budco Taplocks have been sold than all competitor drop marker products combined.

The Budco Taplock. Setting the industry standard, time and time again.

Budco
The Taplock Company. Setting The Industry Standard In Drop Markers.

1-800-331-2246 Ask For Dept. #2051 Fax: 1-918-252-1997
P.O. Box 3065 TULSA, OK 74101

Reader Service Number 63

WHEN QUALITY AND PERFORMANCE MATTER MOST...

VARIABLE OPTICAL ATTENUATOR
FVA-60A series

- 2.5 dB insertion loss (typ.)
- <40 dB return loss option
- 65 dB range, 0.05 dB resolution
- 850/1300 nm or 1300/1550 nm
- Unique 3-Way Powering™
- Includes RS-232 and software
- Step, scan and program modes

POWER/ATTENUATION TEST SET
FOT-90 series

- The only fully integrated test system
- 0.02 dB linearity, 0.01 dB resolution
- Stores/downloads up to 500 readings
- Optional built-in light source (LED or Laser; 850, 1300, 1550, 850/1300 or 1300/1550 nm configurations)
- +16 to -60 dBm range (CATV version)
- Option for RS-232 and software

FULL DUPLEX FIBER TALK SET
VCS-20A series

- 4 functions in one unit
  - Full duplex talk set over 1 fiber
  - Stable source for attenuation testing
  - 2 kHz active fiber detector
  - 2 kHz optical tone generator
- Multiparty voice communication
- >120 km range (1550 nm version)
- Digital quality sound
- 3-Way Powering™, auto-off

RETURN LOSS TEST SET
BRT-320 series

- Wide range: -8 to -70 dB
- High resolution: 0.05 dB
- 1300 and/or 1550 nm
- Small, simple and rugged
- Unique 3-Way Powering™
- User calibration mode
- Test source and ORL meter

Don't let ordinary fiberoptic test equipment be a limiting factor in the performance of your network. For accurate results, test with EXFO. EXFO delivers Reliability, Performance, Customer Support and uncompromising Quality. At EXFO, ISO-9002 standards are strictly applied and a large selection of instruments is kept in stock. When special needs arise, we will go to any length to assist you. Your optical network deserves the best.

MAKE NO COMPROMISE.

Reader Service Number 64

We put FIBER OPTICS to the TEST...WORLDWIDE

USA EAST
Tel: 603-424-8211
Fax: 603-424-8212

USA WEST
Tel: 818-500-0466
Fax: 818-247-1744

EUROPE
Tel: 33-1-3953-9830
Fax: 33-1-3953-9840

MAIN OFFICE
465 Godin,
Vanier, QC, Canada
G1M 3G7
Tel: 418-683-0211
Fax: 418-683-2170

EXFO
Electro-Optical Engineering

Reader Service Number 65

METRONET, INC.
"WHERE DREAMS BECOME REALITY"
- CAD Fiber Optic and Coaxial System Design (Lode Data), Audio,
- On Site Project Management
- Turnkey Services
- Mapping Services-Strand and As-Builts
- Drafting Services-Base, Strand and Electronics
- Auto LISP Programming - Client Specific
- CAD Training and Set Up
- Marketing Services (Dark Fiber)

James P.Worthen
President

Frank Walker
Director of Sales

METRONET INC.
Building 200, Suite 210, 1111 Alderman Drive
Alpharetta, GA 30202
(404) 475-9956 FAX # (404) 475-9944

Taipei Satellite & Cable TV '92

Dates: September 14-16, 1992
Place: Taipei International
Convention Center
Taipei, Taiwan

Sponsor: Cable & Satellite TV Guide
Co-Sponsors: The Cable Television Association of Taiwan
Microelectronics Technology Inc.
United Communications Group

For information please contact:
Cable & Satellite TV Guide
P.O. Box 101-391
Taipei, Taiwan
Tel: 886-2-506-3335
Fax: 886-2-507-2375
or
The Cable Television Association
186, Chung Yang Road, # 7F
Nankang District
Taipei, Taiwan
Tel: 886-2-788-5773
Fax: 886-2-788-5774

lashing machine from the bucket as previously mentioned, the stresses exerted on these components from a fully extended boom (even if only trying to overcome a 100- or 200-pound lateral resistance) is tremendous. It is similar to a large lever prying away at the gear teeth and other parts. Of course the manufacturers purposely over-design in the interest of safety and durability. However, knowledge of this fact should not entice us to stretch the rules from time to time.

The previously mentioned semi-hypothetical story does happen often enough to get concerned about. We have all witnessed it from one time or another. Another common abuse of the lift is using it as a crane to lift heavy objects. I once observed a construction crew lifting a fully assembled 5-meter dish into position on its mount. I'm not sure of the weight of the antenna but I would guess it would have to have been 700-900 pounds and believe me, I held my breath until that thing was bolted into position. I couldn't believe that the bucket and boom would tolerate such abuse without serious damage and also possible injury to the men guiding the antenna. But it did however and I felt at the time that the "big engineer in the sky" had been overlooking that job.

More don'ts

The following are some abuses of equipment and safety rules in the use of bucket trucks. These are definitely "don'ts."

1) Do not allow two people in the bucket at the same time. This usually happens when someone wants to demonstrate something or point something out to another person. Aside from the possibility of excess weight, there simply isn't enough room for two people to work simultaneously.

2) Do not get into a bucket with climbing hooks on and attempt to step out of the bucket onto a pole, roof, tree or some other object.

3) Do not work from the bucket without a safety belt that is properly attached to the belt ring.

4) Do not stand on top of the bucket lip to reach an object beyond the normal reach from the bucket. (This one is surely a widow maker!)

5) Do not get outside of the bucket enclosure for any reason while it is elevated.

6) Do not permit anyone to operate a mobile lift without proper instruction

Ultimate Drop System

Responding with a Solution!

SACHS presents the ultimate response to the needs of the evolving technology. The "UDS" product line gives you an official seal of excellence and commitment with our absolute guarantee of support and service. The ultimate technology for the cable T.V. industry.

SACHS ULTIMATE DROP SYSTEM

UDS®

SACHS®

The Outside Plant Hardware Specialist

Sachs Communications Inc.
PLANT AND SALES OFFICE
211 Stonewall Street
Cartersville, Georgia 30120

SALES OFFICE
9200 East Mineral Avenue
Englewood, Colorado 80112

1-800-829-7224

Reader Service Number 67

Reader Service Number 68

Quality Workmanship is NOT Hard to Find!

We Provide Value Engineering Services At Its Best...

- **FCC Testing and Certification**
- **Fiber Optic Testing and Documentation**
- **Fiber Optic Splicing and Repairs**
- **CAD Design & Services**
- **System Sweeping and Repairs**
- **Quality Service Since 1985 with our *In-House* Staff**

Call Bob Rahmer or Chris Papas at **1-800-779-2074** with your needs.

RTS Value Engineering

Rahmer Technical Services, *inc.*

(Formerly known as Comm-Net Communications, Inc.)

6280 Senior Circle, Douglasville, Georgia 30134

6 REASONS WHY CABLEMATIC IS THE BEST CRIMP TOOL FOR YOU.

1. Clearly visible hex sizes
2. High-strength steel frame
3. Dipped-on full cushion plastic handles
4. Precision hex crimping
5. Heat-treated pins for max strength
6. Quick, precise, easy star wheel adjustment

Connect with the tool that lasts. Cablematic quality means a lifetime of service.

Cablematic CABLE PREPARATION TOOLS

Division of Ripley Company, Inc., 46 Nooks Hill Road, Cromwell, CT 06416
1-800-528-8665 (203) 635-2200 FAX (203) 635-3631

Reader Service Number 69

in the use of the bucket movement controls.

7) Do not continue operation of a mobile lift knowing something is malfunctioning such as leaking hydraulic seals, cracked pins, cracked bucket enclosure, poor stabilizer, etc.

8) Do not operate a lift without a micro-lock and/or wheel chocks in place.

9) Do not use the lift as a crane or in situations where high lateral forces are brought to bear, such as pulling cable or a lashing machine with the bucket.

10) Do not engage in horseplay with your lift such as leaping from the bucket to a pole or tree, standing on the bucket rim, driving down the road with the bucket ascended, etc.

11) Do not subject the bucket and lift arm to unnecessary heavy stresses by pushing through heavy foliage and tree limbs.

The dos

As important as it is to heed the "don'ts," it is equally important to adhere to the "dos" to ensure safe dependable operation of your mobile lift. Some important "dos" are as follows:

1) Do routinely and regularly perform the maintenance functions required such as greasing, checking hydraulic hoses, oil, pumps and electrical systems and switches. Keep a dated record and logs both for in the office and in the vehicle.

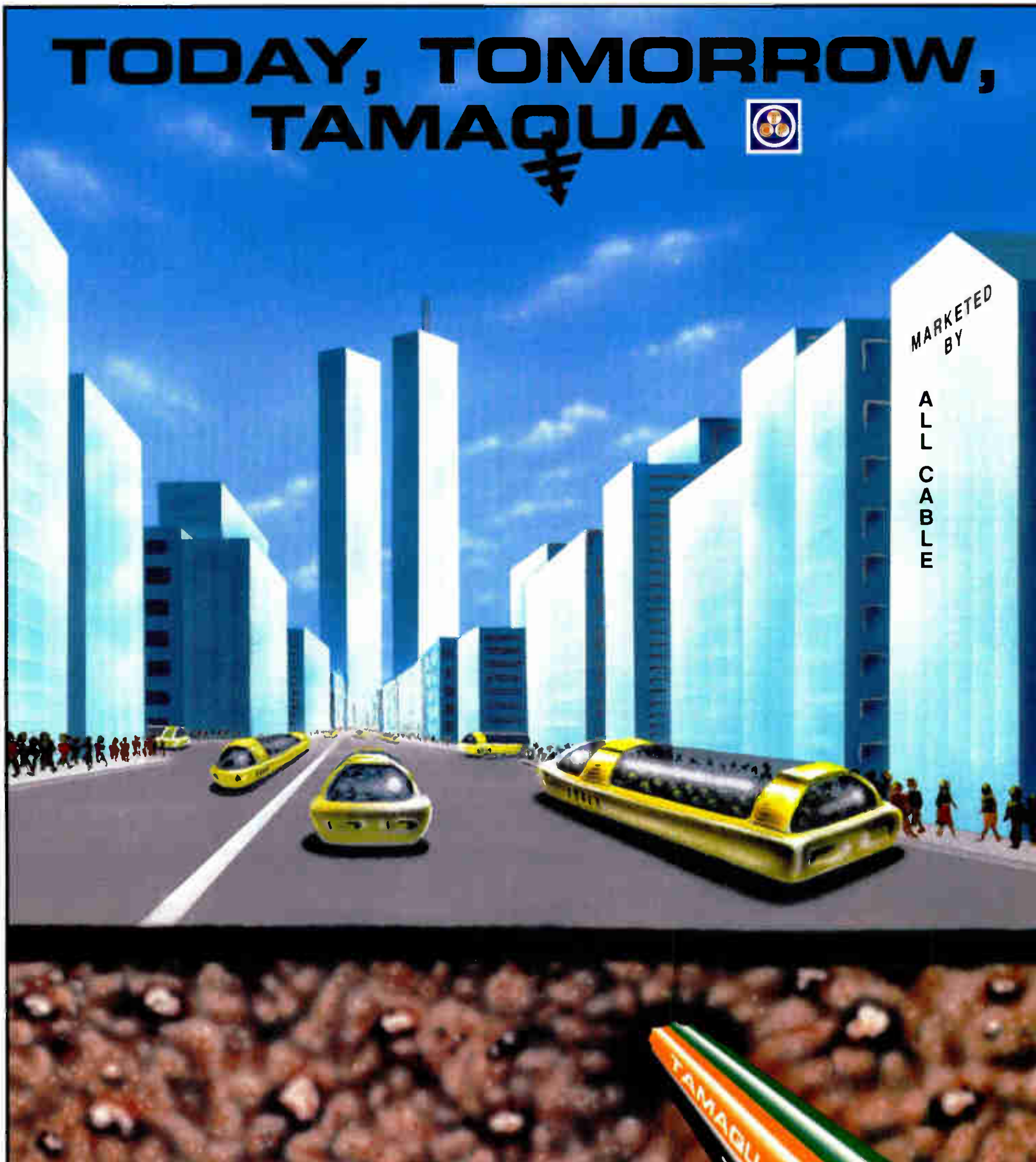
2) Do make needed repairs a priority. Do not put off even minor items for another day because it could result in an injury or costly repair later.

3) Do operate the lift within the rated weight capacity.

4) Do use your lift intelligently and within the range of tasks for which it was designed.

For a long lift life and trouble-free operation of your mobile lift a little common sense is mostly what is required. The lift itself is surely built to perform beyond its stated specifications and the professional maintenance programs will find and correct potential problems before they become major repairs.

Perhaps the two most important tips to good safe bucket truck operation are: Keep that "loose nut" behind the bucket controls well secured and the most important grease to be applied is the "elbow grease" to perform the simple checks that should become routine and second nature to a good lift operator. **BTB**



Today's ducted systems for pre-installed coaxial cable or fiber optic ***cable in conduit***. Tomorrow's long-term protection and savings for your investment in underground construction.

TODAY, TOMORROW, TAMAQUA

MANUFACTURED BY Tamaqua Cable Products Corporation, Schuylkill Haven, PA 17972

CALL: 800-232-0883 **FAX**: 203-235-2454 **PA**: 717-385-4381

Reader Service Number 70

Early CATV: Falling tools, shotguns, snakes

By Len Ecker

There is so much new and exciting in the world of cable today — fiber optics, digital compression, high definition TV (HDTV) — that it makes an old-timer like me wish I could roll back the years and be young again.

Unfortunately, I can only look back at what was. As I do, I have to wonder how we ever got this cable TV business going when we knew so little. I realize now that nothing in my days at Georgia Tech prepared me for what was to consume 40 years of my life.

My first encounter with cable really wasn't cable at all. I heard about a community in Pennsylvania where an enterprising appliance dealer had picked up some TV signals on a local hill and delivered them into town to help sell TV sets. He'd never heard of coaxial cable, so he used what was available — twin lead. The town center was the county seat — court house, offices and jail — and to avoid running the wire around the block he took a direct route: in a window on one side and out on the other.

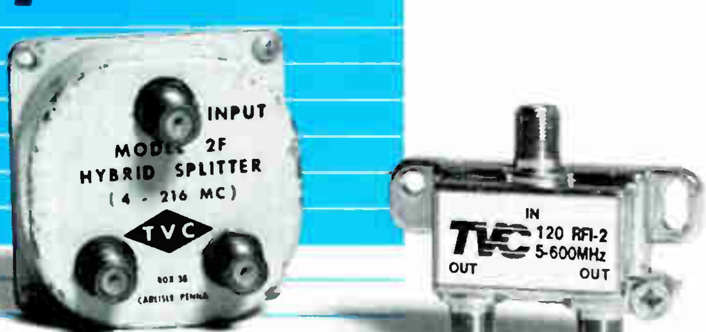
An "accidental" career

Since I found this interesting, I thought I might like to get involved in this endeavor as a sideline. It looked easy, and the extra money would come in handy for my young family. So I spent a cold winter night on a hill in central Pennsylvania watching a picture that appeared on a TV set. Since I didn't know where it originated, I had to wait for station identification. Finally, I learned the signal was coming from Dallas. Soon after, it disappeared. →

Do You Remember the Model 2F Hybrid Splitter?

Cable television was still in its early days when TVC first offered the Model 2F Hybrid Splitter. And, while its streamlined modern day counterpart looks quite a bit different, each shares the characteristic quality for which TVC is known.

Since 1952, TVC has built a reputation for reliable cable equipment, reasonable prices and prompt service. In this, our fortieth anniversary year, we'd like to thank all of our customers for helping us grow into the nationally recognized company that we are today.



TVC INCORPORATED

East: TVC Supply—Hershey, PA (717) 533-4982 1-800-233-2147
West: TVC/Horizon—San Clemente, CA (714) 361-2011 1-800-755-1415
Southwest: TVC Supply—Houston, TX (713) 956-2984 1-800-346-3759
Southeast: TVC/Interstate—Sarasota, FL (813) 371-3444 1-800-245-4423
Corporate Office: 1746 E. Chocolate Avenue, Hershey, PA 17033

40 Years of Quality

Reader Service Number 71

COMTECH SUPPLY, INC.

WORLDWIDE DISTRIBUTOR

* STOCKING *

CATV * TELEPHONE * POWER

* DATA PRODUCTS *

Established 1975

Comtech Supply de Argentina, S.A.
Sanchez de Bustamante 880
(1173) Capital Federal
Argentina
Phone: (541) 885482, (541) 8628561
FAX: (541) 8624295

Comtech Supply Inc
1952 N.W. 93rd Ave.
Miami, FL 33172 USA
Phone: (305) 592-3948
FAX: (305) 592-9646

Reader Service Number 72

Reader Service Number 73

ACS
Communication
Services, Inc.

When you need contract services, you want results.

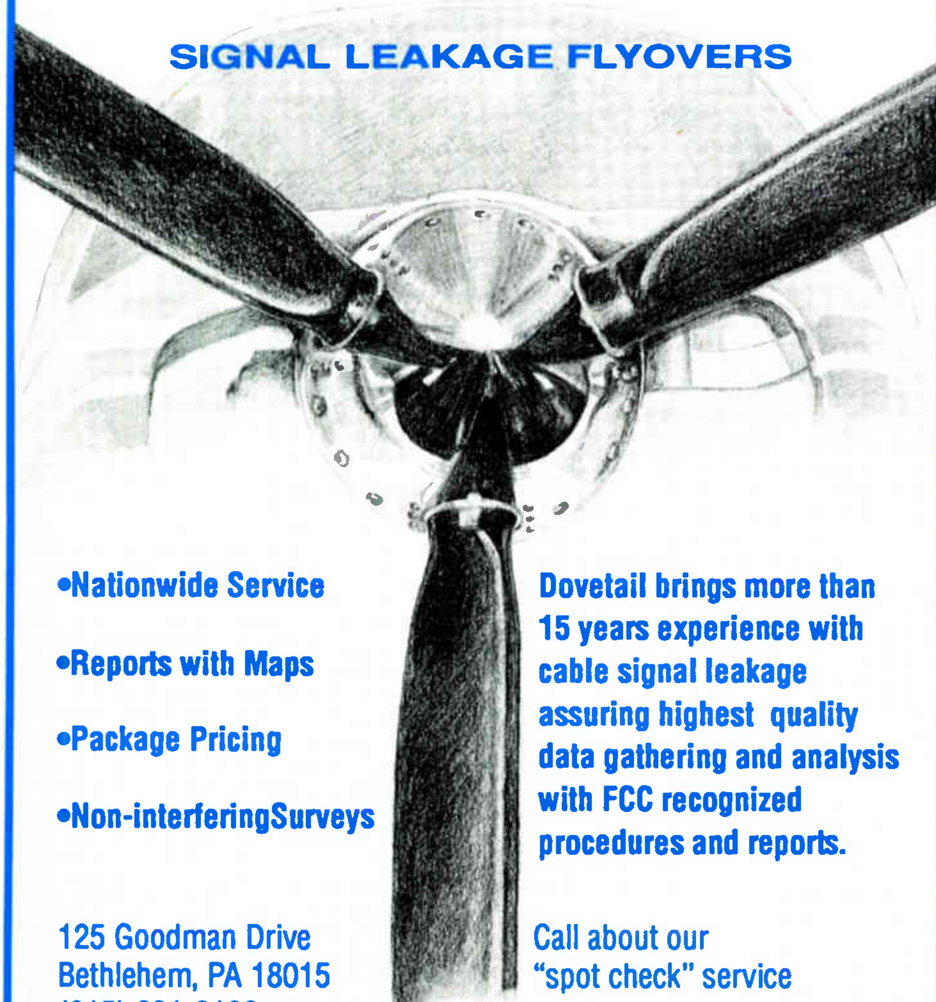
ACS delivers best!

If you need

☐ mapping ☐ construction ☐ ug ☐ aerial
☐ post wires ☐ installations ☐ audits
call for more information or quote:
1-800-266-7744

Dovetail
Surveys
Inc.

SIGNAL LEAKAGE FLYOVERS



•Nationwide Service
•Reports with Maps
•Package Pricing
•Non-interferingSurveys

Dovetail brings more than 15 years experience with cable signal leakage assuring highest quality data gathering and analysis with FCC recognized procedures and reports.

125 Goodman Drive
Bethlehem, PA 18015
(215) 691-0100

Call about our "spot check" service

Reader Service Number 74

Since I'd never heard of ducting or temperature inversion, I was at a loss to explain what had happened. Somehow, though, I knew that this signal would never be the basis of a system, and I gave up on the ideal of pursuing this new enterprise. Thus, it was only by accident that I finally became involved in what would be cable TV.

My wife, on a visit to her hometown, met with a neighbor whose husband was seeking an engineer for a new venture. He hired me, and I found myself building a cable system in South Williamsport, Pa.

Those early days were long and hectic. The local mountains provided a way to pick up TV pictures from Philadelphia, which, by those standards of the day, were usable. Since boxing and wrestling were the major TV events, we knew we had a good picture when you could tell the black trunks from the white ones.

Perils on the mountain

Those days on that mountain were an experience I would not want to repeat. To get the best possible reception, we built an H-frame tower so all the antennas might be at the top. A local TV repairman helped in the construction process and turned out to be more a menace than a help. Any time he was on the tower, tools rained down from every pocket. Who'd ever heard of hard hats?

That first winter ice was a major problem. When it rained in town, it invariably turned to ice on the mountain. We soon learned that a shotgun and buckshot would clean the ice off the tower without damage, and we could climb up.

The headend shack was just that, a plywood shanty with cinder block steps. Those steps were to play a dramatic role in my life on the mountain.

These Pennsylvania mountains were well-populated with rattlesnakes and water moccasins. One Sunday I escaped to the mountain to watch a football game. I hadn't bothered to put on the normal knee-high boots I always wore at the antenna site. As I left to go home, I stepped out and bang! — a rattlesnake was sunning himself on the top step. Being a snake, he immediately challenged my right to share the choice position with him. I still have fang marks on my ankle, which, though they've faded over the years, are still faintly visible.

That mountain was loaded with

REFURBISHED
MODULATOR'S

Scientific Atlanta
6330 6350
9260 9220
416 6250

Blonder Tongue
SAVM MAVM
ESHM ESM

Cadco
150 250

Catels
TM1400 TM2400

DX
DSM110 DSM140

Triple Crown
HEM-W HEM

Drake
2310 2410

REFURBISHED
RECEIVER'S

Scientific Atlanta
6601 6602
6650 6680
9530 9531
9630 9640

DX
643A 644

Standards
32C/K 24PC
24S 24SC

Microdyne
CRS
LPR
FFXS
FFC

REFURBISHED
PROCESSOR'S

Cadco
151 251

Scientific Atlanta
6130 6150

Triple Crown
HEP-W HEP

Phase Com

Precise

Pico

REFURBISHED
LINE GEAR

Scientific Atlanta & Sylvania/Texscan

Line Extenders
300 mz 330 mz
400 mz 450 mz

Trunk Amplifiers
300 330
400 450

Tap's
Pads
EQ's
DC's

REFURBISHED
LNC'S

270-770 mz
360-1 360-2
362 9360
Cal-Amp

900-1400 mz
Down Convertors
LNB's

760-1260 mz
Standard

950-1450 mz
LNB's

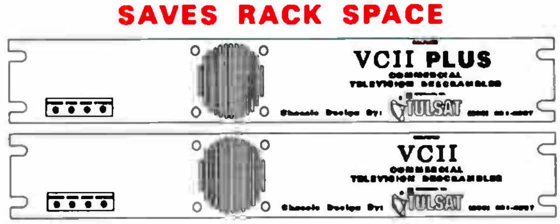
4-gz
LNA's

WE SELL, REPAIR & PURCHASE ALL EQUIPMENT LISTED

SPECIAL
50° Cal-Amp Commercial LNB's $89.00
50° Cal-Amp LNA's $119.00

$139.00
HALFSIZE VCII CHASSIS

THERMOSTAT CONTROLLED FAN
SAVES RACK SPACE

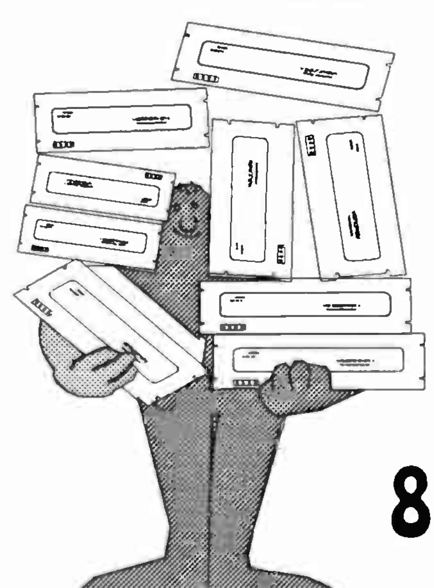


MOST REPAIRS IN ONE WEEK

MOST REPAIRS $93.00

FACT
1991
* *Average Repair Charge*
LESS THAN **$100.00**
Including Parts
* Dosen't Include Line Equipment or Shipping Charges

We FIX ® VIDEOCIPHERS



VCII PLUS
*UPGRADES & EXCHANGES
+ IRD CARD
OR
STANDARD +
$269.00
*Must Be Working White Label or IRD

DRK ENTERPRISES, INC.
DBA
TULSAT®

800-331-5997

® VideoCipher is a registered trademark of General Instrument

1575 N. 105th E. Ave Tulsa, Oklahoma 74116 (918) 836-8348

Reader Service Number 76

MADE ★ IN ★ USA

MANUAL PROGRAM SWITCHING WENT OUT WITH RABBIT EARS!

Manual program switching has become obsolete since Monroe Electronics developed the Series 3000 family of switching and control products. And now SYNOPSIS software is available to control the Series 3000 family. Series 3000 and SYNOPSIS can control all of your headend switching needs more easily than you ever thought possible from wherever you happen to be. So don't become a thing of the past — stay on top of your switching needs with Series 3000 and SYNOPSIS!

100 HOUSEL AVE LYNDONVILLE NY 14098
716 765 2254 FAX 716 765 9330

MONROE ELECTRONICS

OUR CRIMPERS ARE APPLAUDED . . . BUT OUR STRIPPERS BRING THE HOUSE DOWN

HEX CRIMP TOOLS
- Wide range of tools with HEX sizes as specified by connector manufacturers.
- Built-in adjustment, extends tool life.
- MK1050 Field maintenance kit, your performance backup for worn parts replacement.
- A complete tool for every size.
- CATV, MATV & STV standard RF Applications.

COAXIAL CABLE STRIPPER
- Safety yellow color, high visibility.
- Non-adjustable tool steel blades.
- Replaceable blade cartridges snap right in.
- Clean out feature removes debris.

For more information on these and other tools please contact:

cable prep®
BEN HUGHES COMMUNICATION PRODUCTS CO.
207 Middlesex Ave., Dept. D.M.
P.O. Box 373
Chester, CT 06412-0373
Tel: (203) 526-4337
FAX: (203) 526-2291

Reader Service Number 77

wildlife. Besides the snakes there were deer, bears, wildcats, wild turkeys and all sorts of small game. That made hunting season a reign of terror. I conceded the mountain to the hunters for two weeks and waited with bated breath for it to end. If the picture remained on, I heaved a sign of relief. Upon returning to the mountain I always found insulators shot away and bullet holes in the shack. And, if that were the extent of the damage, I felt fortunate.

Having completed the mountain-top site, it became necessary to get the signals off the mountain. Following the road into town was an 18-mile trip. The only other way down was a straight line from the shack to the closest highway — a mere 7,000 feet. With state permission we built a pole line, sliding them down from the top. We learned how fast a pole can move when one of them broke loose and careened down the slope until it finally wedged between two trees and broke in half—quite a feat for a 45-foot class 1 pole.

Life on the mountain was a never-ending experience. One day, while working with a technician assigned to me, we were carrying a ladder for some midspan splicing when I heard a distinctive danger signal — a rattle. I didn't say anything to my partner, and just kept walking. Only after we'd passed out of danger did I stop and point to the bed of rattlers we'd just walked through. You know, it's funny. It was weeks before he'd go up on the mountain with me again.

I learned many things they don't teach in college up on that mountain. For instance, all sorts of animals think PVC, the cable jacket, is a salt lick. They were constantly chewing on the cable. The larger animals, meanwhile, used the poles to scratch themselves so after a while the splinters made the poles poor risks for climbing.

When the day finally arrived that we could see actual TV pictures at the bottom of the hill, I heaved a sigh of relief to be off that mountain. Little did I realize the tough job was yet to come, but, that's another story. **CT**

Len Ecker started in the cable industry in 1950 with a five-channel broadband system in Williamsport, Pa. In 1956 he went to work for Jerrold and in 1966 became the engineering advisor to the marketing group. Later he was heavily involved in Jerrold training seminars. Today he owns his own consulting company, The Len Ecker Corp.

THE SOUND INVESTMENT

It's a tough market out there and the smart money goes with a sure thing whenever it's available. That's why more top MSO's put their money on Leaming audio equipment. It has the proven assets to return a high yield of performance and reliability.

It's clear why the industry is bullish on Leaming equipment. Products like the MTS-2B BTSC Stereo Generator offer more standard features than any comparable unit and at a very comparable price.

Sharp, clean audio with a frequency response flat out to 15 kHz, typical stereo separation >30 dB, true AGC, Bessel-null test-tone, dbx® noise processing, and stereo synthesis for ad insertion are basics that Leaming buyers have come to expect.

This is the kind of dependable equipment that operators want to have on-line for the not-so-far-away day when every minute of broadcast time will be in stereo.

So, if you're in the market for success, take this insider tip and call or write today for more information on the full line of audio equipment. Make Leaming your next sound investment.

LEAMING INDUSTRIES

15339 Barranca Parkway, Irvine, CA 92718
(714) 727-4144 • FAX (714) 727-3650
(800) 4-LEAMING

THE MTS-2B IS PREFERRED BY MORE TOP MSO'S THAN ANY OTHER ENCODER

Reader Service Number 78

CORRESPONDENT'S REPORT

What is the status of a 1,310 nm fiber-optic amplifier?

By Lawrence W. Lockwood
President, TeleResources
East Coast Correspondent

My last column on optical amplifiers was in January 1990. With the speed of developments in this field that corresponds to the ice age, erbium-doped fiber amplifiers have improved and been deployed in the field for applications at 1,550 nm and there have been striking advances in the development of a 1,310 nm fiber-optic amplifier. Production of a satisfactory 1,310 nm fiber amplifier would be of enormous significance to CATV since the installed fiber in CATV (and in general elsewhere) is almost exclusively 1,310 nm — not 1,550 nm.

Currently there are two generic types of optical amplifiers, the semiconductor optical amplifier (SOA) and the erbium-doped fiber optical amplifier (EDFA). Their applications in optical transmission are shown in Figure 1. Using one at the transmitter increases the output level of the optical signal. This is a handy method of

"It looks as if praseodymium-doped fluoride fiber amplifiers will, with further development, come close to meeting the gain and power requirements of an ideal amplifier."

Figure 1: Optical amplifier applications

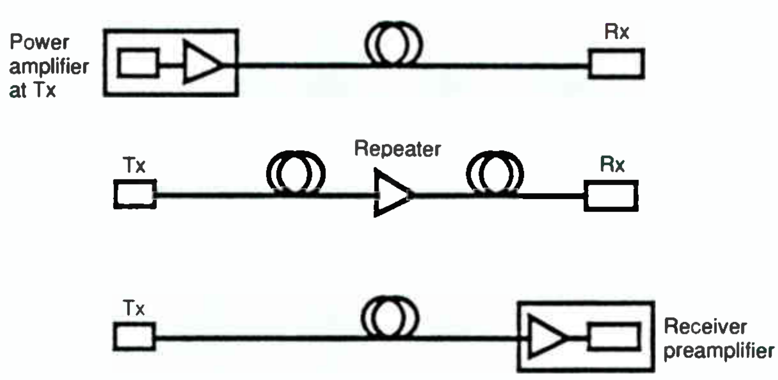


Figure 2: Schematic of semiconductor laser amplifier

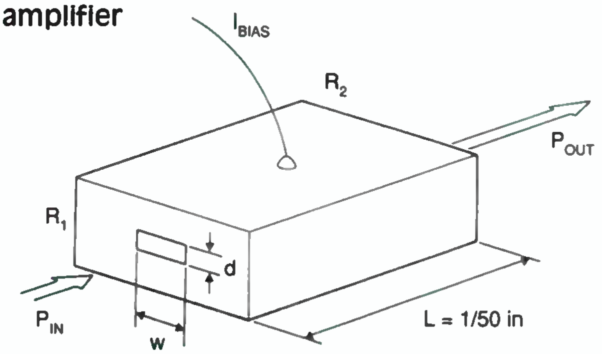
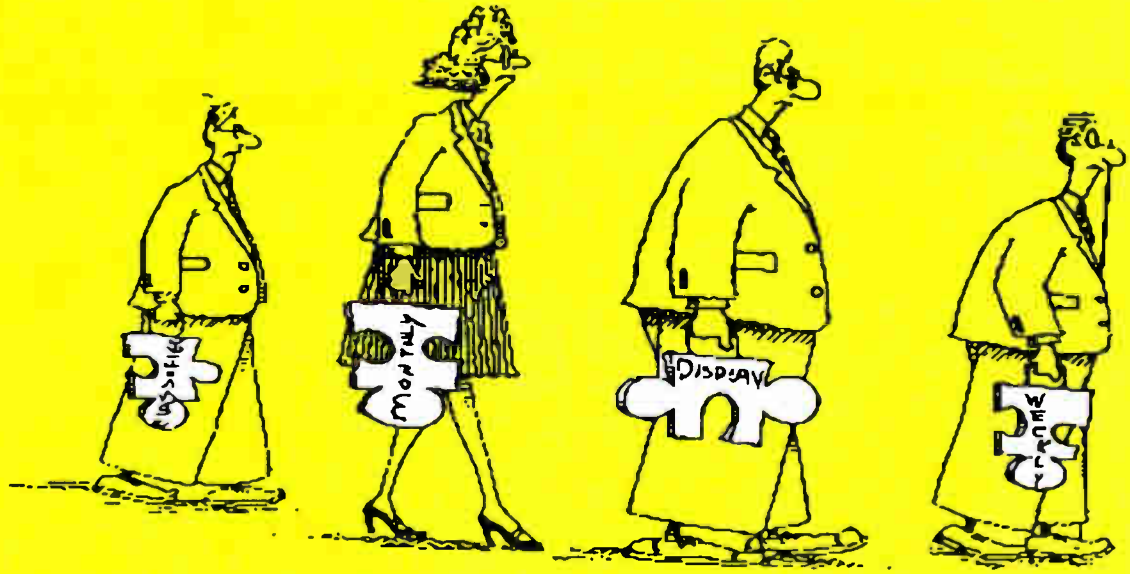


Figure 3: An SOA



Tired of trying to fit the pieces together for your advertising campaign?

Let us help!

We can offer packages in the domestic market as well as international. No other publications in the industry can reach these two distinct markets.

NO OTHER!

1-800-325-0156

Barbara, Charles, Mike, Patty, Bill and Linda

COMMUNICATIONS TECHNOLOGY
Domestic Readership

CableFAX
Executive Readership

INTERNATIONAL CABLE
International Readership

Figure 4: Schematic of operation principle of an EDFA

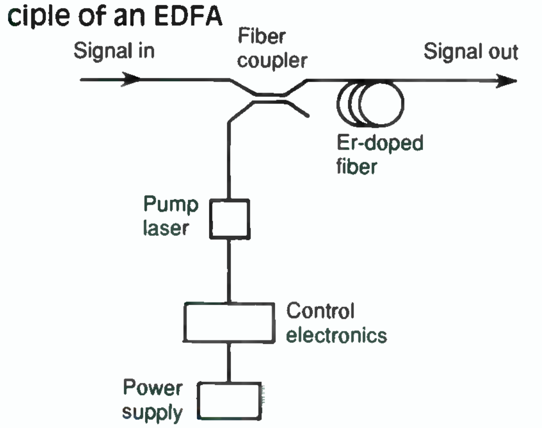
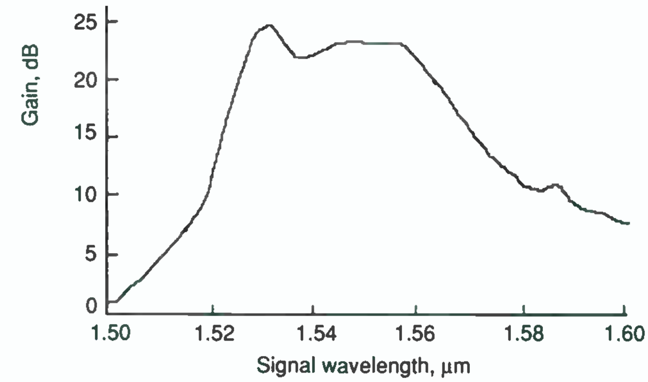


Figure 5: Gain vs. wavelength characteristic of erbium fiber amplifier



providing sufficient signal levels (power budget) to permit subsequent splitting and branching of the transmission path. Use in mid span permits a longer total path and using one at the receiver permits the use of a signal whose level has decreased to an otherwise unacceptable amount.

Semiconductor optical amplifiers

The SOA uses the same basic construction as the conventional Fabry-Perot semiconductor laser. As shown in Figure 2 on page 86, a typical SOA has a 500 µm (1/50 in) long buried heterostructure, which is the active region (wxd) that the optical signal enters, traverses the 500 µm and exits amplified. Antireflection coatings (R_1 and R_2) are applied to the laser facets leaving a residual reflectivity of less than 0.5 percent (in a conventional Fabry-Perot laser the reflectivity is approximately 30 percent). The effect of the greatly reduced reflectivity is to significantly increase the lasing threshold of the device. This means that the operating current and the accompanying optical gain may be increased without the amplifier lasing.

The SOAs are interesting because they can be made in different forms so that they can amplify at 1,550 nm or at 1,310 nm. However, the available performance of SOAs has not promised imminent deployment in fiber-optic systems because they are highly non-linear in operation and also semiconductor gain is highly dependent on the polarization state of the optical input signal, which varies greatly in the output of typical fiber feeding the signal into the amplifier.

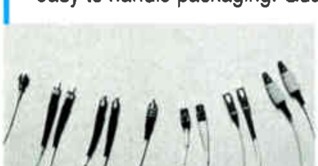
Gould Fiber Optics Has . . .
The Service You Depend On
The Specifications You Count On
The Quality You Rely On

For CATV systems go with Gould Wavelength Independent Couplers (WIC™) for virtual wavelength independence in broadband applications.

Count on Gould's low insertion loss of ≤3.7dB over a ±40nm wavelength range at both 1310nm and 1550nm and get the best directivity specification in the industry ≤-65.0dB.

Depend on Gould's sales engineers and customer service staff for clear product information and fast delivery.

Rely on Gould's quality components for thermal stability and easy to handle packaging. Guaranteed to perform!



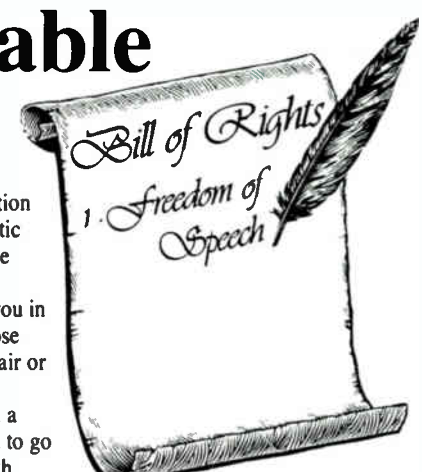
Gould packages components the way customers need them. Get NTT compatible FC or SC connectors or a variety of other styles including biconic, ST or SMA.

6740 Baymeadow Drive
Glen Burnie, MD 21060
1-800-54-GOULD or (410) 787-8300

GOULD
Fiber Optics

Reader Service Number 80

Protect Your Inalienable Rights



At that crucial time of restoration or installation of your fiber optic network, communication in the field is vital. The ALT 7601 Electro-Optic TalkSet keeps you in touch by allowing you to choose optical fiber, sheath, twisted pair or any combination. The ni-cad battery powered unit comes in a rugged carrying case designed to go wherever you need it. And with 46db range on fiber and 15-50 mile range on metal, our aim is to guarantee your freedom of speech. For more information, write, call or fax:

Automated Light Technologies, Inc.

MADE IN USA

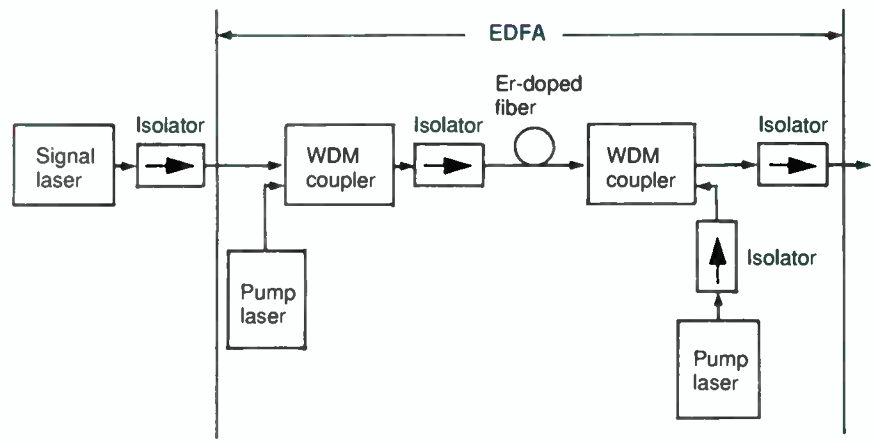
562 Captain Neville Dr., Waterbury, CT 01675
800-648-8871, 203-757-4200, Fax 203-757-4204

Reader Service Number 81

Correction can be achieved by active monitoring and control of the SOA gain but this adds to the complexity of the optical amplifier. This problem does not exist in fiber-optic amplifiers because the amplification occurs in the doped fiber, which is circularly symmetric and thus insensitive to signal polarization. Compared to EDFAs, the higher noise figures, poorer high-power linearity of SOAs restrict their usefulness in AM analog video transmission but are satisfactory for FM.

The photograph of an SOA (Figure 3 on page 86) shows the heart of an amplifier, the semiconductor package (placed in front of the SOA). This SOA is made by British Telecom and DuPont (BT&D). BT&D has done a great deal of the research and development in the field of optical amplifiers, both SOAs and EDFAs.

Figure 6: Typical EDFA circuit



Optical amplifiers for 1,550 nm

Figure 4 shows schematically the configuration of a pumped fiber to illustrate the basics of operation of an EDFA. Pump power (usually at either 980 nm or 1,480 nm) is absorbed by the erbium in the length of doped fiber (which is a short 10 to 20 meters in length) creating stored excited state electronic energy. Signal photons then stimulate electronic-to-optical power conversion at the signal wavelength. When input signals are at the 0 dBm level that is typical of signal lasers, the efficiency with which pump photons are converted to signal photons can exceed 80 percent, resulting in output powers greater than 15 dBm. While the fiber provides a gain medium when pumped, when unpumped the fiber becomes very lossy at the signal wavelengths (1,550 nm region). This loss is about 5 to 6 dB per meter of Er-doped fiber, so the total absorption for a typical device may be as high 80 dB. However, in the 1,310 nm region the absorption is very low (in either the pumped or unpumped state), with absorption losses of less than 0.005 dB/m at 1.2 µm wavelength. The gain vs. wavelength characteristic of erbium fibers is shown in Figure 5. →

Introducing the RMS new PowerKing™ Standby Power Supply Model PSSB-60.

Call your Sales Rep for information on the complete PowerKing™ line of Power Supplies.

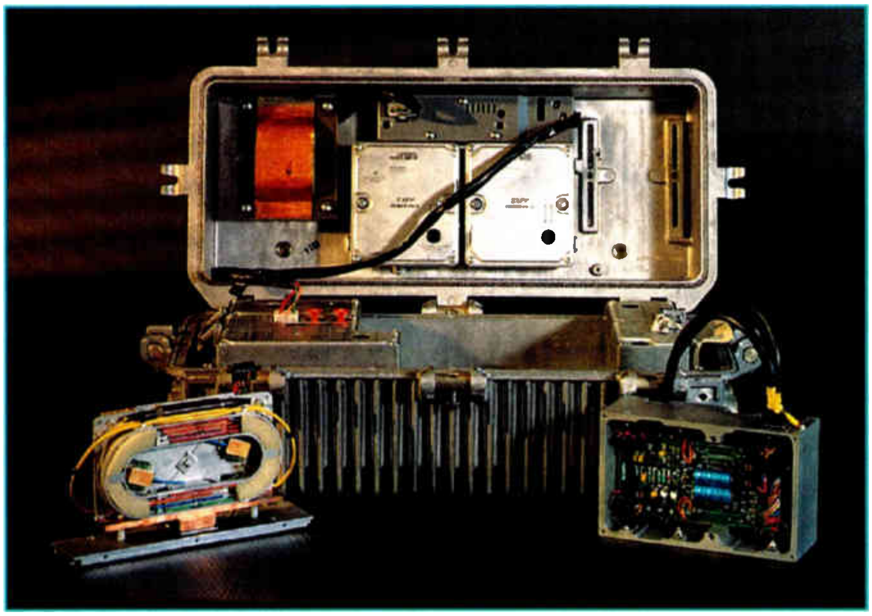
RMS Electronics Inc.
41-51 Hartz Way
Secaucus, NJ 07094

Tel: (800) 223-8312
FAX: (201) 601-0011

Model: PSSB-60
15 Amp - 2 Battery

Reader Service Number 82

Figure 7: Optical amplifier (left) and power supply (right) modules, with Jerrold SX amplifier housing specifications



Specifications

Environmental/mechanical		**Operating/performance**	
Ambient temperature range	-40° to +60° C	Pump wavelength	1,480 and 980 nm
Power consumption	30 watts	Input power	-6 dBm to +4 dBm, typical
Housing		Saturated output power	15 dBm, typical
Strand-mount	SX amplifier	Noise figure	4 dB, typical
Rack-mount	3.5 in (h) x 19 in (w)	CSO/CTB distortion	70 dBc
Optical connectors	FC-APC		

There are three possible arrangements for pumping the amplifier. The pump can be fed in at the input of the amplifier (Figure 4 on page 88) so it travels in the same direction as the signal (a propagating pump) or it can be fed in at the output of the amplifier so that it travels in the opposite direction to the signal (counter-propagating pump) or the amplifier can be pumped at input and output (dual or bidirectional pumping). It may seem intuitively wrong to amplify using a pumping beam travelling against the signal, but after all the sole function of the pumping beam is to excite the erbium ions so that they can provide the signal amplification and it doesn't matter in which direction that exciting beam comes from. The gain of the amplifier is not affected by pumping configuration. Figure 6 on page 89 shows a typical EDFA circuit.

A joint development program between Jerrold and BT&D produced an EDFA that is packaged in a standard Jerrold housing. The amplifier has a gain of approximately 15 dB. Its current price is $30,000. (See Figure 7.)

At a recent meeting of the Optical Society of America (OSA), interesting

The **Right Equipment** for the **Right Price**

CCR-2

CCR-4

Checkout our Cable Fault Locators

✔ User friendly
✔ Accurate measurement
✔ High resolution, backlit LCD
✔ Cost effective
✔ Memory to store and compare line responses

Contact us for your Clic Rep

clic Instruments Ltd.

Clic Instruments Ltd.
2630-A Lancaster Rd.
Ottawa, Ontario K1B 5L8
(613) 731-9030

Reader Service Number 83

FCC

WILL YOU MEASURE UP?

Cable System Report Card

	Pass	Fail
C/N	x	
S/N		x
Levels	x	
Response	x	
Differential Gain		x
Differential Phase		x

ATC's **Tests & Measurements** seminar is designed to ensure that your staff has the skills necessary to meet the proposed new signal quality standards being implemented by the FCC. This cost effective, **"hands-on"** seminar can be taught at your location as well as at our state-of-the-art facilities in Denver.

START PREPARING NOW!

Call Today! **(303) 753-9711**
For Pricing and Scheduling Information

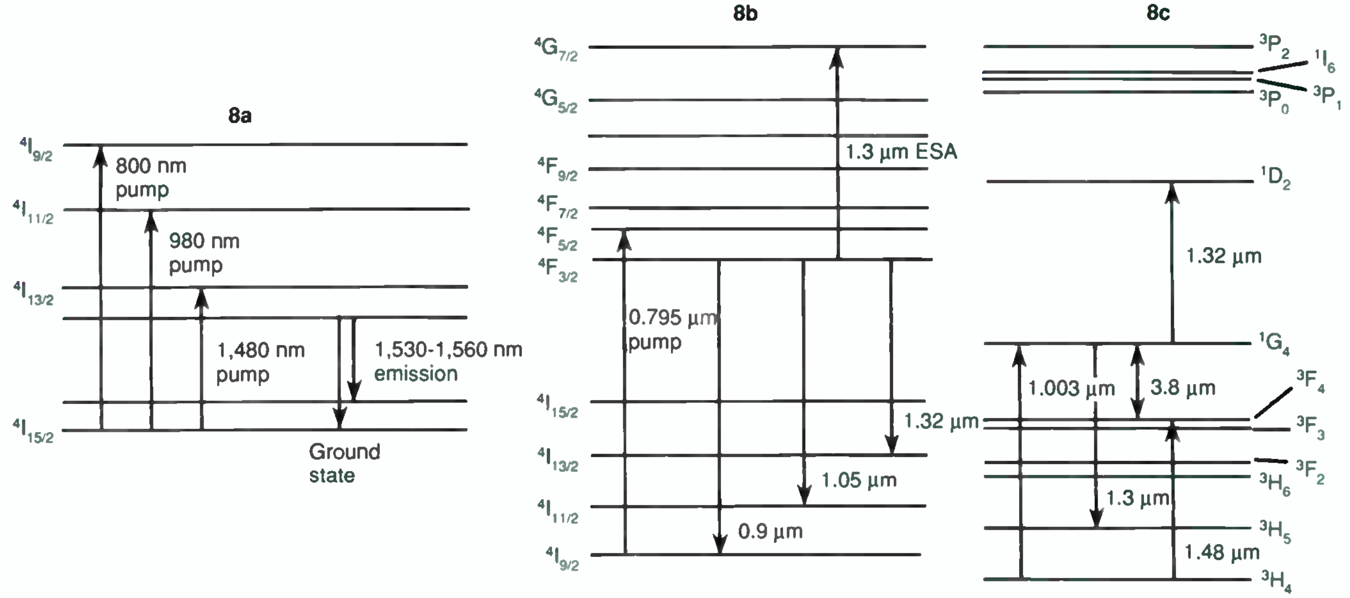
Stop and see us at the
Cable-Tec Expo Training Lounge

ATC
A Time Warner Company

ATC National Training Center
2180 South Hudson Street
Denver, CO 80222

Reader Service Number 84

Figure 8: Energy levels of Er, Nd and Pr



work with fiber amplification was reported. Distributed amplifiers, made by lightly doping the fiber and pumping its entire length, promise a "lossless" fiber. Analysis coupled with experimental results indicates that with erbium concentrations of about 1 ppm and 70 mW pump lasers spaced at 30 km (19 mi) intervals, a lossless fiber can be achieved. One group demonstrated a lossless fiber length of 14 km at a signal of -10 dBm, and another showed that a lossless 19x19 star coupler can be made using 19 amplifier fibers and a single 980 nm pump.

Optical fiber amplifiers for 1,310 nm

But how to get a fiber amplifier for 1,310 nm since erbium, the amplifying dopant, will amplify at 1,550 nm only? In the January 1992 issue of *Optics & Photonics News* (a publication of the Optical Society of Ameri-

MORE THAN JUST ANOTHER TEST HOUSE

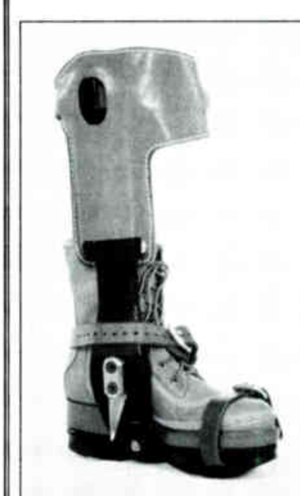
DIVERSIFIED T.E.S.T. TECHNOLOGIES, INC.

Diversified Services with
TESTING
EVALUATION & CONSULTING
SITE SURVEYS
TRAINING SEMINARS
From design review to certification for
FCC - 15, 18, 68, 76, 90 - CISPR - VCCI
UL - CSA - VDE - TUV - EN - CE - CATV
Safety, Susceptibility & Site Surveys
30 meter open-field range

DIVERSIFIED T.E.S.T. TECHNOLOGIES, INC.
1-800-221-6452
Route 222 • P.O. Box 8 • Groton, NY 13073
607-898-4218 • FAX: 607-898-4830

Reader Service Number 85

TALON Dielectric Spurs



- Nonmetallic resin construction provides dielectric protection
- Premium leather upper cuff
- Adjustable height
- Replaceable ankle, leg & toe straps
- Fully adjustable gaff position
- Articulated foot plate with non-slip sole for easy walking
- One size fits all and accommodates both summer and winter footwear
- Use standard work boots
- Provides a platform foot support- no more arch pain or discomfort from past foot injuries
- Puncture resistant sole plate

NIAGARA SAFETY PRODUCTS

IN CANADA
P.O. Box 25
Fort Erie, Ontario
L2A 5M6

Phone 416-871-7111
Fax 416-871-6181

IN U.S.A.
P.O. Box 59
Buffalo, New York
14205-0059

Reader Service Number 86

Comparison of optical amplifier properties

	SOA	EDFA	NDFA	PRFA
Net gain	20 dB	35 dB	7 dB	32 dB (reported)*
Output power	+3 dBm	+15 dBm	+14 dBm	+20 dBm (reported)**
Bandwidth	45 nm ≅ 7,900/5,600 GHz	45 nm ≅ 5,600 GHz	30 nm ≅ 5,300 GHz	25 nm (predicted) ≅ 4,400 GHz
Center wavelength	1,300 or 1,500 nm	1,500 nm	1,300 nm	1,300 nm
Pump	Electrical	980 or 1,480 nm	795 nm	1,010 nm
Noise figure	8-10 dB	3-4 dB	3-4 dB	3-4 dB (expected)
Status	Commercially available		Experimental but PRFA is promising	

*NTT
**BT

ca), M. Brierly of BT Labs presented a most interesting report on the current status of development work in the 1,310 nm amplifier field.[1] (British Telecom, BT, is the British part of BT&D.) In this report he sets out an ideal specification for a 1,310 nm amplifier:

"Ideal specification: An ideal optical amplifier for 1.3 µm will be capable of high gain, greater that 30 dB (100 times) between the incoming and outgoing fiber. It will amplify signals at least from 1.28-1.31 µm wavelength, and preferably shorter and longer, simultaneously and with the same gain at all wavelengths. It will operate bidirectionally with minimum extra noise added to the signal. It will not be sensitive to signal polarization. It will not have any interference between signals with the gain-bandwidth (crosstalk), and will operate on both analog and digital signals from kbit/s to multi-Gbit/s. It would be very linear over a wide range of input levels and capable of high output power operation under saturated conditions. It should be reliable and self contained, i.e., should not depend on physically large pump lasers, and should be power efficient. These are very difficult specifications to meet, but the EDFA comes close in all but wavelength — hence the reason for researching a 1.3 µm alternative."

A good deal of experimentation has been conducted with doping another rare earth element, neodymium, but these have only so far produced an amplifier with 10 dB gain at 1,345 nm for only 50 mW pump power. This amplifier departs from the ideal specification in that the gain is low and is also at too long a wavelength.

A further, and currently the most promising, option is the praseodymium-doped amplifier — praseodymium being yet another of the rare earth elements. S. Davey, a BT scientist, first observed fluorescence at 1.3 µm in praseodymium-doped ZBLAN glass in 1989 and suggested that amplification might be possible. (ZBLAN is a heavy-metal fluoride glass.) The fiber doped with Pr is ZBLAN glass rather than silica. The year 1991 seems to have been "the year of the praseodymium-doped fiber amplifier," with many publications appearing, each with better results than the last. However, none of the results come close to being "ideal" in one major respect, i.e., power efficiency. The pumping wavelengths for Pr are 1,007-1,017 nm and at this time such pumping lasers are not commercially available.

However, Y. Miyajima of NTT in a recent report to the OSA announced work at NTT that achieved a 38.2 dB

SAY YES TO KES

FOR EXCELLENT SERVICE & GREAT PRICES ON A FULL LINE OF EQUIPMENT & CABLE.

24 HOURS A DAY, 7 DAYS A WEEK, 365 DAYS A YEAR

KES Klungness Electronic Supply
CATV SYSTEMS AND SUPPLIES 1-800-338-9292

MEMBER SCTE

Reader Service Number 87

REPRINTS

Communications
Visibility
Knowledge
Information

Reprints work for you!

For more information call Marla Sullivan at Transmedia Partners today! (303) 355-2101

INTERNATIONAL CABLE

The only cable TV magazine sent by expedited mail, reaching the largest number of decision makers throughout the world ... more than 10,000! Bonus trade show distribution at 16 international CATV exhibitions on five different continents.

Six editions still to come in 1992:

Month	Closing date*	Show /location
June	April 20	Canadian Cablexpo (Canadian CATV Association) Vancouver, B.C.
		(SCTE) Cable-Tec Expo '92 San Antonio,Texas, USA
July	May 15	IBC (International Broadcasting Convention) Amsterdam, The Netherlands
August/ September	June 15	C.A.N.I.T.E.C. (Mexico National Convention)
		Broadcast '92, Tel Aviv, Israel
		Taipei Satellite & CATV '92 Taipei, Taiwan
October	August 14	CTA Cable Convention 92 London
	September 15	CATV '92, Tokyo (Japan CATV Association)
		Jornadas y Exposicion, Buenos Aires, Argentina (Argentine CATV Chamber)
December	October 15	The Western Cable Show Anaheim, California, USA

*Exhibition dates, locations and distributions are subject to change

Contact Bill Parker, associate publisher; or your account executive: Barbara Bellomo, Linda Sommer or Patty Linster at:

International Cable
50 South Steele Street, Suite 500
Denver, Colorado, USA 80209
Telephone: (303) 355-2101 Fax: (303) 355-2144

CT's Bookshop is Open!

Currently Available:

Volume I - Coaxial Construction of Trunk and Feeder Systems
Volume II - Fiber-Optic Use in Cable TV

Future Volumes:

- Headend Systems
- Distribution Systems
- Drop Construction and Installation
- Addressability
- Microwave Systems
- Tests and Measurements
- Training
- Preventive Maintenance
- Data Communications
- Audio Systems

Transmedia Partners
50 S. Steele, Suite 500 • Denver, CO 80209 U.S.A.
Phone: (303) 355-2101 • FAX: (303) 355-2144

For Sales Assistance:Reader Service Number 90 For Information Only:Reader Service Number 99

signal change, equivalent to about 32 dB of true amplifier gain in the fiber used. More significant perhaps is the fact that the pump power to achieve this gain was only 300 mW, and that usable amplifier gains were obtained from only 100 mW of pump power.

So, it looks as if praseodymium-doped fluoride fiber amplifiers will, with further development, come close to meeting the gain and power requirements of an ideal amplifier. But what about the other requirements? NTT researchers report a saturated output power of 8 mW in their high gain fiber, but BT Labs report 100 mW in a less power efficient fiber, which certainly satisfies the output power requirements. The noise figure (the degradation in signal-to-noise ratio) of the BT device was estimated to be less than 6 dB, and could be lower. For those interested in the quantum energy levels involved in Er, Nd and Pr, they are shown in Figures 8a, 8b and 8c respectively on page 91.

The accompanying table on page 92 shows typical operating parameters for all the optical amplifiers discussed.

Conclusions

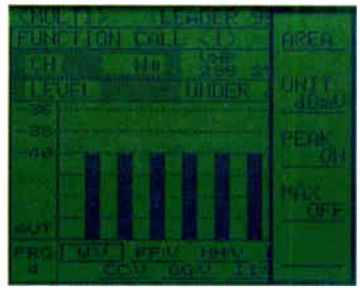
Is Pr the ideal 1,310 nm amplifier? The answer is obviously "no, not yet," but the praseodymium-doped fluoride fiber amplifier comes far closer than any other. It has the inherent linearity, low crosstalk and polarization insensitivity of other fiber amplifiers and fits the bill in terms of gain, output power and noise requirements. Perhaps the suspect area is in the efficiency (0.2 dB/mW compared to 11 dB/mW for the EDFA), and pump source availability. However, it is less than one year since the first report of gain in this system, and with developmental work progressing apace we might be surprised sooner rather than later. **CT**

References

1 "Progress On Optical Fiber Amplifiers for 1.3 µm," M. Brierly, *Optics & Photonics News*, January 1992.
2 *Fiber Optics Communications Handbook*, Technical Staff of CSELT, Edited by F. Tosco, Tab, 1990.
3 "Optical Amplifiers Make Their Move", J. Mellis, *Lasers & Optronics*, August 1991.
4 BT&D specifications.
5 Jerrold specifications.

Multi-Channel Bargraph Eases Comparison of Channels

Single Channel Display Includes Digital and Analog Readouts



Pop-up Menus For Entry To Special Functions

Auto Select AC/DC DVM

AUTO CHANNEL SEARCH

NEW CONCEPT IN CATV LEVEL METERS
MODEL 951

Now there's no need to preset or manually tune through all the channels. Let the Model 951 do an **auto channel search** for active channels in your region. The unit will detect 32 active channels and display them segmented by frequency from four data storage registers that can be saved as data results or as programs for future measurements.

Start measuring right away without channel listings or charts. The 951 can be used in both simple and sophisticated operation modes.

For **simple operation** use four buttons in the MEASURE section. Measurements will be displayed with auto-ranging and scaling. Or you can program the unit with pop-up menus with soft key selection to guide you through the unique features and functions to facilitate custom programmed measurements.

Call toll-free
1 800 645-5104
In NY State
516 231-6900

LEADER
FOR PROFESSIONALS WHO KNOW THE DIFFERENCE

Leader Instruments Corporation, 380 Oser Avenue, Hauppauge, New York 11788
Regional Offices: Chicago, Dallas, Los Angeles, Atlanta. In Canada call Omnitronix Ltd., 416 828-6221

Reader Service Number 91

BOOKSHELF

The following is a listing of videotapes currently available by mail order through the Society of Cable Television Engineers. The prices listed are for SCTE members only. Non-members must add 20 percent when ordering.

☛ *Questions and Answers with FCC Engineers* — Former Federal Communications Commission Engineer and Consultant Cliff Paul and the FCC's John Wong discuss FCC rules and regulations with Cable-Tec Expo '87 attendees in this interactive workshop. (1 hr.) Order #T-1039, $45.

☛ Category I Review Course: Signal Processing Centers (Technician Level) — Category I Curriculum Chairman Alex Best presents a one-hour review course on the technician level of this BCT/E category. This workshop from Cable-Tec Expo '87 offers technicians an overview of material contained in the certification exam. (1-1/2 hrs.) Order #T1040, $45. **B-I**

☛ *Category VII Review Course: Management and Professionalism* — Category VII Cirriculum Committee Chairman Wendell Bailey discusses the purposes and prerequisites for this category's essay examination. A sample question is presented and discussed with BCT/E candidates in attendance. (1 hr.) Order #T-1041, $35. **B-VII**

☛ Pole Climbing — A comprehensive course produced by the Atlee Cullison Training School that develops climbing skills and safety habits. Includes valuable information on climbing apparel and equipment, safe methods of ascending, descending and testing poles to ensure safe climbability. (1 hr.) Order #T-1042, $170.

Note: The appearance of the symbol **B-** indicates a videotape relating to a certain category (noted by Roman numerals **I-VII**) of the BCT/E Certification Program. These tapes have been discounted to aid candidates for certification in their studies. All videotapes are in color and available in the 1/2-inch VHS format only. Videotapes 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, 669 Exton Commons, Exton, Pa. 19341 or fax with credit card information to (215) 363-5898.

A complete listing of SCTE publications and videotapes is included in the March 1992 issue of the Society newsletter "Interval."

SAFER
AERIAL INSTALLATIONS

Tension Master™
Aerial Pulling Systems protect fiber and coaxial cable from...

...over-tensioning and maximizes pull distances. For safer aerial installation productivity, crews need to continuously monitor and record tensions from the bucket—and on the ground. Using the TM-315A Hydraulic Tension Module and the TM-175 Electronic Tension Controller results in fewer assist or figure-eight locations, safer pulls and lower costs.

For further information and a copy of our bulletin, contact your ARNCO rep, or call:

1-800-321-7914

ARNCO

ARNCO CORPORATION
860 GARDEN STREET • ELYRIA, OH 44035
PHONE: (216) 322-1000 • FAX: (216) 323-7111
TELEX: (910) 240-8273

C-2017-ARN *Reader Service Number 92*

SMOOTHER
CABLE INSTALLATIONS

Hydralube® F-150 cuts friction over 40%* on difficult cable pulls

A high performance, silicone-based, lubricant that incorporates tiny spheres, F-150 is particularly beneficial for long, fiber optic cable pulls. It's compatible with all types of cable and duct, adheres to moving cable and leaves a residual lubrication film wherever it's employed. F-150 is safe and non-toxic to workers and the environment. Specify F-150 cable lubricant from ARNCO, for your most demanding requirements. The result—faster, smoother pulls at lower cost.

For further information and a copy of our bulletin, contact your ARNCO rep or distributor, or call:

1-800-321-7914

ARNCO

*When compared with water-based polymer lubes.

ARNCO CORPORATION
860 GARDEN STREET • ELYRIA, OH 44035
PHONE: (216) 322-1000 • FAX: (216) 323-7111
TELEX: (910) 240-8273

C-2014-ARN *Reader Service Number 98*

AD INDEX

It's so simple! To obtain additional information from any of the display advertisers appearing in this issue of ***Communications Technology***, please use one of the **Reader Service Cards** on the facing page (pass the others along). The ad index below has been expanded to include not only the page number of each advertiser, but also each corresponding reader service number to be circled on the Reader Service Card.

BUSINESS DIRECTORY/CLASSIFIEDS

COMMERCIAL ELECTRONICS, INC.
CATV ENGINEERING SERVICES

CATV EQUIPMENT REPAIRS

Hybrid Sales | Meter Calibrations
Equipment Upgrading | Headend Alignment
Performance Measurements | FCC Offsets

Free Pick-up Service In Certain Geographic Areas
800-247-5883 or in Virginia 800-345-6834
209 E. Jackson St. P.O. Box 484 Gate City, VA. 24251

California Amplifier

U.S. manufacturer of; C-Band and Ku-Band LNBs, Feedhorns and accessories; Wireless Cable (MMDS) products including LNAs, downconverters and the Beambender™, a low cost microwave repeater; and special application products including ARABSAT LNBs and Commercial IF Amplifiers.

Contact: Dennis Schwab
California Amplifier, Inc.
460 Calle San Pablo, Camarillo, CA 93012 U.S.A,.
TEL: (805) 987-9000 FAX: (805) 987-8359

GREATER VISIONS

"Communication You Can See"

- C.A.D. Drafting Service
- Project Cost Analysis
- Engineering
- Construction

10102 Hwy. 105 W.
Montgomery, TX
77356

David Christy
409-588-2099

519 E. Center
Sikeston, MO
63801

TCS CABLE, INC.

TCS CABLE, INC.
SINCE 1978

- COAXIAL & FIBER CONSTRUCTION
- TECHNICAL SERVICES
- PLANT MAINTENANCE
- RESPLICE/UPGRADE
- SWEEP/PROOF SERVICES
- FIELD ENGINEERING SERVICES
- PROJECT MANAGEMENT SOFTWARE

CORPORATE OFFICE
2674 WEST LAKE ROAD
PALM HARBOR, FL 34684

(813) 789-6826
(813) 787-5077 (FAX)
(800) 999-8270

SAVE YOUR MONEY.

Lower your costs for programming, equipment, and service through group purchasing. Join today.

NATIONAL CABLE TELEVISION COOPERATIVE, INC.

14809 West 95th St. Lenexa, KS 66215 913-599-5900

- Aerial & Underground Construction
- Strand Mapping
- System Design
- Residential & MDU Installations
- Subscriber Audits
- Proof of Performance
- Fiber Optics and L.A.N. Services

Cablemasters Corp.
Our Name Says It All

Contact:
Bernie Czarnecki
(814) 838-1466
P.O. Box 219
Lake City, PA 16423

Serving Denver & The U.S.A.

THE AutoCAD EXPERTS

- Base/Strand/Design Drafting
- RF or Fiber System Design
- Scanning & Plotting
- CAD Set-up & Consulting

Exceptional Quality At Competitive Prices!

Call today and receive our *Free* newsletter loaded with tips and facts about CATV and AutoCAD including a cable symbology reference chart for your office!

BLOCK & WHITE
1228 15th ST. #403
Denver, Colorado 80202
303·534·3545

AUTHORIZED PARTS CO.

New and Used Converters
Headend & Line Equipment
Leader in Parts Supply

Experienced Export Staff

USA Office: 708-658-6900 • 24 Hour FAX: 708-658-0582

AMS-1 CHARACTER GENERATOR

ATARI Computer and Software only $499.00!

OPTIONAL BATTERY BACKUP!

- *Character Generators*
- *VCR Controllers*
- *Video Switches*
- *Custom Hardware and Software*

Dickel Communications Co.
517 14th Street / Des Moines, IA 50309

FAX 515-243-2563
Tel. 515-244-1526

ANTENNA, TRANSMISSION LINE, AND TOWER SERVICES

Microflect now offers the following additional services:

- Antenna and transmission line procurement
- Antenna and transmission line testing and troubleshooting
- Microwave path alignment
- Tower, antenna, and transmission line inspection

For more information, contact Microflect's Marketing Department.

MICROFLECT

3575 25th Street SE • Salem, OR 97302 • P.O.Box 12985 • Salem, OR 97309
(503) 363-9267 • TLX 510-599-0107 • FAX (503) 363-4613

Quality Workmanship is NOT Hard to Find!

We Provide Value Engineering Services At Its Best...

- **System As Builts and Strand Mapping**
- **FCC Testing, Certification, Sweeping and CLI**
- **CAD Services, Fiber/Coax Design**
- **On-Site Project and Engineering Management**
- **Quality Service Since 1985 with our *In-House* Staff**

Call us at **1-800-779-2074** with your needs.

RTS Value Engineering

Rahmer Technical Services, *inc.*
(Formerly known as Comm-Net Communications, Inc.)

6280 Senior Circle, Douglasville, Georgia 30134

MIDWEST CABLE SERVICES

— NATIONWIDE BUYERS —
CATV SCRAP CABLE AND USED LINE GEAR

P.O. Box 96
Argos, IN. 46501

(219) 892-5537
FAX(219) 892-5624

New Construction • Installs • Balancing • Splicing

Bigham
Cable Construction, Inc.

Performance Built Our Company
Specializing in Rebuilds and Fiber Optic Installation

Harold Bigham
(904) 932-6869

P.O.Box 903
Gulf Breeze, FL 32562

CHARLES E. KIRTLEY

DIRECTOR OF MARKETING AND NEW DEVELOPMENT

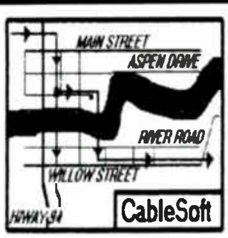
EXCALIBUR CABLE

ALL INSTALLATION SERVICES · UNDERGROUND CONSTRUCTION
MDU PRE/POSTWIRES · REBUILDS · AUDITS · CONVERTER EXCHANGES
ENGINEERING AND DESIGN · LAN · FIBER · COAX PHONE

37 SYCOLIN ROAD, S.E.
LEESBURG, VA 22075

TOLL FREE 1 (800) 462-3811
FAX (703) 478-8818

Telecommunications Engineering & Consulting



Cable Soft
Engineering Services
P.O. Box 5042
1500 12th Avenue
Coralville, IA 52241
(319) 337-8412 Office
(319) 337-8487 Fax

Call for literature
Cable Television - Telephony - Cellular Radio
H. Mark Bowers, Owner

Kennedy Cable

For Aerial and Underground Construction Services

Est. 1972

"Fiber Optic Specialist"

Kennedy Cable Construction, Inc.
(P.O. Box 760) 30453, (912) 557-4751

Reidsville, Georgia
WATTS 1-800-673-7322

STATEWIDE C.A.T.V.

State Wide C.A.T.V. Inc.

466 County Road 75, Mechanicville, NY 12118
Telephone 518-664-5970
Fax 518-664-9723

Specializing in Fiber Optics
Aerial and Underground CATV Construction

Michael Wallace, Vice President

CCI **CABLE CONSTRUCTORS, INC.**

COMPLETE TURNKEY CONSTRUCTION 1-800-338-9299

COAX & FIBER
MAPPING - DESIGN - CONSTRUCTION - ENGINEERING
COMPLETE PROJECT MANAGEMENT

quality service performed on a timely basis

KES Klungness Electronic Supply

CATV SYSTEMS AND SUPPLIES 1-800-338-9292

We still believe we can do this for less than you!

CABLE TELEVISION SYSTEM SERVICES

A SIGNAL LEAKAGE DETECTION SERVICE
CLI DRIVE-OUT • CLI REPORTS • CLI SOFTWARE
OVER 500 CLI DRIVE-OUTS COMPLETED

Todd Borst
Gwen Valenzuela

P.O. Box 458/209 N. Grand
Schoolcraft, Michigan 49087
Phone: 616/679-4513
800/837-7611

Professional Installation & Technical Service, Inc. Cincinnati, Ohio

An Engineering Services Company dedicated to:

- Proof of Performance Tests
- Sweep and Balance - Splicing
- Electronic and Underground Upgrades
- Power Supply Upgrades/Maintenance
- System Maintenance and Repair
- Fiber Optics Testing and Activation

All of our employees are customer conscience, dedicated and experienced in State-of-the-Art systems.
(CALAN and WAVETECH equipped) **800-457-4569**

CONTRACT CABLE TV INSTALLERS

CONTRACT INSTALLERS, INC.

UHF Radio Equipped Trucks • Uniformed Installers

HOUSE INSTALLATIONS
Aerial — Underground — Pre-wire
APARTMENT INSTALLATIONS
Post wire — Pre-wire — Commercial Building
Tap Audits

Install or Remove Traps and/or Converters
Drop change over for System Rebuilds

LENNY FISCHER
P.O. Box 1564
Appleton, Wisconsin 54913-1564
(414) 582-7087

MONTIE FISCHER
P.O. Box 1058
Fort Walton Beach, Florida 32549-1058
(904) 651-5154

COMM SPEC

"Your Communications Specialists."

Contact: Don Sicard
CommSpec
P.O. Box 968
Haverhill, MA 01831
TEL (508)373-0657

- Microwave radio repair, specializing in M/A-COM radios
- Field services such as maintenance, path alignment, sweeping and tuning waveguide
- Complete AM, FM & satellite systems design and installation
- Training services from instructors to course development

Industry Serviced Since 1966

ROCKY MOUNTAIN JUMPER CABLES

P.O. BOX 9707 • HELENA, MT 59604

CUSTOM MADE JUMPER ASSEMBLIES

ALL BRANDS FITTINGS	ALL BRANDS CABLE
• F Male	• RG - 59
• F Female	• RG - 56
• BNC	• RG - 11

We have the best price and best delivery. Any length, colors available.

Ask about next day shipments

CALL OR FAX **406-458-6563**

CDS **CAD DRAFTING SERVICES, INC.**

Contact:
Charles Wright
(815) 698-2541
206 E. Cloke Box 432
Ashkum, Il. 60911

- Base Mapping
- Strand Mapping
- Digitizing Services
- As-Built Mapping
- System Design
- AutoCad Drafting

and a full line of Drafting Services

"Quality service for all your cable drafting and design needs"

White Sands

Jumper Cables

CUSTOM MADE CABLE ASSEMBLIES INCLUDING:
F to F, N to N, BNC, RCA, F-81

Gilbert AHS, LRC, Off Shore, Amphenol
RG-56, RG-59, RG-11, RG-213, RG-214
Belden, Times, Comm Scope, Intercomp

We will make any cable assembly. Quick delivery on all colors and lengths.
Fax: (602) 582-2915, PH: (602) 581-0331
335 W. Melinda Drive, Phoenix, AZ 85027

Autocad CAD Drafting Service
System Design/Map Maintenance
Aerial & Underground Construction
Splicing & Activation

Call now for more information

VOGTMAN
ENGINEERING, INC.
Richard S. Vogtman
Chief Engineer
125 W. Center St.
Linwood, MI 48634
FAX: (517) 697-3081 Phone: (517) 697-3807

FCC PERFORMANCE TESTING

TSB

FIBER OPTIC DESIGN & ACTIVATION
HEADEND OPTIMIZATION
COMPLETE SYSTEM AUDITS

AUTOCAD CUSTOMIZED CATV MENU & SYMBOLS LIBRARY
CAD DRAFTING & DESIGN
STRAND MAP & AS BUILT
MAP DIGITIZATION & REVISIONS

CORPORATE OFFICE (605) 665-1393 FAX (605) 665-1708
800-292-0126
FIELD OFFICE (708) 541-3993

E-CABLE, INC.

A Full Service Organization

• Aerial/Underground Construction • Rebuilds • Audits
• Pre/Post Wire MDU & Design • Installs • FIBER & MMDS

Northern Region	Central Region	Southern Region
414-536-8488	901-366-0056	504-733-4037
Milwaukee, WI	Memphis, TN	New Orleans, LA

Quality Service to the Cable Industry
Call for our Brochure
P.O. Box 533826 Orlando, FL 32853
(407) 438-3646

G.C.I.

GOLD COMMUNICATIONS INC.
Gerald Goldman, C.O.O.

Products for:
CATV, Satellite, Fiber Optics, SMATV
Educational Systems, Broadband L.A.N. Systems

170 Kipp Avenue • Elmwood Park, NJ 07407
Tel./FAX: 1-201-797-0631

RCH CABLE

DOOR TO DOOR SALES
AUDITING
INSTALLATIONS

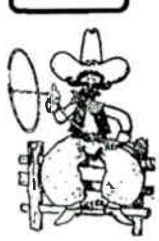
over 15 years experience
(609) 829-3700
(800) 637-9021
FAX (609) 829-0495

contact:
Bob Halgas, President
Nick Gentile, Vice President

905 Rt. 130 South
Cinnaminson, NJ 08077

SCTE®

CABLE-TEC EXPO '92



Interested in the business directory and/or classifieds?
Call Mike Elmer at Communications Technology magazine.
1-800-325-0156

Secure Business Communications

ITFS/MMDS PRODUCTS AND SERVICES
FCC APPLICATIONS/ANALYSIS
ENGINEERING • CONSULTING • SALES

(714) 621-1004

THOMAS M. GLAB
MANAGER

P.O. Box 627
Claremont, CA 91711
FAX 714-624-2257

MultiVision

Area Technical Supervisor

We are currently seeking an Area Technical Supervisor for systems located in the coastal North Carolina area. This individual will be responsible for the management of all facets of daily technical operations. Qualified applicants will have two to four years CATV experience; supervisory experience is a plus. Knowledge of CATV test equipment is also required. Qualified applicants must be familiar with proof of performance testing, system sweeps, pole transfers and CLI compliance. In return for your cable expertise, we offer an excellent benefit package and wages that are equivalent to your abilities and experience. To apply please forward a resume, including salary history and requirements, to:

MULTIVISION CABLE TV
Attn: Wayne Holliday
P.O. Box 1328
Williamston, NC 27892

An EOE

Career Opportunities

Leader in the placement of Cable Television Professionals
Call Toll Free 800-433-2160: In Texas call 817-599-7623: FAX 817-599-4483

Since 1977 Jim Young & Associates has been serving the Recruiting needs of the Cable Television industry.

Our bottom line has and will continue to be your success.

On our 15th anniversary, we would like to take this opportunity to say thank you for our success.

JIM YOUNG & ASSOCIATES
One Young Plaza 1235 Ranger Highway Weatherford, TX 76086
Call for information about these and many other opportunities nationwide

Position Wanted

Degreed (B.S. Management, MBA in August '92) sales/marketing professional seeks marketing position with established, growth oriented firm marketing to CATV/LAN/telecommunications industry. Strong technical and financial background in addition to domestic and international sales management, marketing communications, advertising, and service management skills. Also available for temporary or consulting assignments. Please respond to 1-317-326-4744.

CITY OF MORGANTON

Marketing Coordinator for new cable television system, city of Morganton, NC. A progressive southern community of approximately 15,000 citizens. Recent election held voted for municipal construction and ownership. Position to be filled during construction of system. Duties will involve marketing cable tv, developing and implementing advertising and promotional materials. Will supervise a small staff of customer service employees. Will provide liaison with programming, community access and civic programming committee. Skills: public speaking, marketing, writing, and developing materials. Should be computer literate. Prefer college degree in marketing or related field and experience. Excellent benefits. Call Personnel Director for application and information package at 1-704-438-5255, or write and send resume to: Personnel Director, P.O. Drawer 430, Morganton, NC 28655. Closing date: May 8, 1992. Equal Opportunity Employer. FAX: (704) 438-5264.

CATV MANAGER: City of Morganton, NC. New municipal system in progressive southern community of approximately 15,000 citizens. Recent election held voted for municipal construction and ownership. Position to be filled at beginning of construction of system with approximately 100 miles, 5000 subscribers. Position will oversee construction, when completed will manage system. Successful applicant will be self starter, highly motivated with strong electronic background as well as headend experience. Knowledge and experience with fiber optics is major plus. Supervisory experience important. Five years cable operations experience with some management experience desired. Excellent benefits. Call Personnel Director for application and information package at 1-704-438-5255, or write at P.O. Drawer 430, Morganton, NC., 28655. Closing date: May 8, 1992. Equal Opportunity Employer. FAX: (704) 438-5264.

Equipment

CONVERTER PROBLEMS SOLVED

If your having problems with your converters or problems with your repair service, TRY US!

NORTHEAST CABLE ELECTRONICS, INC.

JERROLD QUALIFIED FACTORY SERVICE CENTER

Guaranteed High Quality Service

For Fast Service or Information, call

1-800-237-6069

In Connecticut call: 203-443-7675

Emergency Alert Systems BY

IdeA/onics

69 Channels
14 day delivery
Compatible with all headends
Affordable
24 & 88 Channel units also available
(701) 786-3904
Fax: (701) 786-4294

ADDRESSABLE CONVERTERS FROM $11.95

IN STOCK

FULLY REMANUFACTURED – 90 DAY WARRANTY

List your equipment for sale with us — computerized Inventory Locater system —

CONTEC INTERNATIONAL

NEW YORK: 800-382-2723 | FLORIDA: 800-758-2288 | MICHIGAN: 800-584-8007

WHY PLOW?

"More $aving$ For You "

- **It's Faster!**
- **Lower Machine Costs**
- **Less Down Time**
- **Nationwide Reliability**
- **Cuts Restoration**

"Call Now For Free Brochure"

1-800-383-7569

ANTHONY'S Manufacturing Service

Converter Service

- **Call for new customer discounts**
- Serving Cable Systems Nationwide
- Specialists on Jerrold Addressable - including baseband
- 30+ years of conbined experience in Converter Service

PRO inc

1-800-466-2776
1600 S. Noland Road, Ste. 110
Independence, MO 64055
Fax: 816-254-5782

AERIAL BUCKET TRUCKS

Large selection geared for CATV
STANDARD TRUCK & EQUIPMENT CO., INC.
1155 Hill St. S.E.
Atlanta, GA 30315
Phone: 1-800-241-9357

BUCKET TRUCKS

CAUTION... Switching your TV/COMPUTER VHF signals with our HI-ISOLATION RELAYS can be habit-forming! 1P2T, 1P4T, 1P8T, MATRIX RANDOM ACCESS; TELE, RESPONDERS; TIMERS. Video Audio, RF. HUGE $$ SAVINGS. **Catalog** PH/FAX 818-957-0618 ALAUN ENGINEERING, MONTROSE, CA

CATV DATA LINK

$$ Inventory Liquidators $$

!! WANTS !!

Your excess and obsolete equipment
Amplifiers, Converters, Passives or ???

IN STOCK REFURBISHED GUARANTEED SPECIALS:

JERROLD JLE-300-2W WITH NEW HOUSINGS	$90.00
JERROLD JLE-400-2W WITH NEW HOUSINGS	$100.00
JERROLD TRUNK/BRIDGER STATIONS 300MHZ	$250.00
MAGNAVOX TRUNK STATIONS ST300/330	$350.00
MAGNAVOX LINE EXTENDERS 5LE300/330	$100.00
S/A 400MHZ TRUNK STATION WITH BRIDGER	$400.00
S/A 330MHZ LINE EXTENDERS	$120.00
S/A 8510 CONVERTER W/REMOTE	$38.00

(619)757-3008, FAX (619)757-4048

SubTRACKER CATV BILLING SYSTEM

Statements, Database, Reports, IBM Compatible, Low Cost, Fast. Ideal for small to medium systems.

LAN and Multi Town Capability.

Canergy Cable Software
403-354-2510 or Fax 403-354-8780

Lashers & Construction Tools

The Lasher & Manlift Specialists
Since 1981
CABLE LASHERS
Any Make, Any Model
SHIPPED NATIONWIDE
We buy used Lashers
Rebuilds Returned in One Week
Purchase Orders Accepted

Call For Price List

Aerial Equipment Service Company
7351 Hazard Avenue, Unit B
Westminster, CA 92683
Phone:714-895-4863
Fax: 714-893-6986

WE NEED SURPLUS NEW & USED

Connectors, Taps, Headend, Line Gear, misc.

TM BROKERS

5402 Highway 95
Cocolalla, ID 83813
Phone: 208-683-2797
208-683-2019
Fax:208-683-2374

FREE SHIPPING CASH PAID

We Need: Magnovox, Jerrold, Scientific-Atlanta (X-cess, Used, In Field)
We Pay: Top Prices!!
We Give: 1 Year Warranty On Refurbished Equipment

ACHIEVE PEAK PERFORMANCE

RMT ENGINEERING, INC.

1-800-228-0633 FAX: (408) 773-0937

---

dB-tronics®

For Your Equipment Needs

CALL US FIRST!

- **AFFORDABLE, QUALITY REPAIRS:**
  We Are THE SA Addressable Converter Repair Experts!
  8500's, 8550's, 8580's
- **WE BUY & SELL EQUIPMENT:**

SA PP 450MHz LE's	$109.00
SA FF 450MHz TA's	$299.00
SA PP 400MHz BRDGR	$90.00
8556-005 Scramblers	Call

Hurry, Limited Quantity Available

FREE REPAIRS?
Repair Credits Given For Your Excess Equipment!

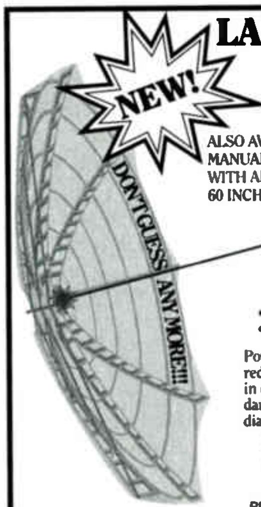
FOR OTHER SPECIALS CALL:

SALES
404-992-6730 • 614-885-1520

CUSTOMER SERVICE
Phone: 1-800-356-2730 • FAX: 1-803-439-7518

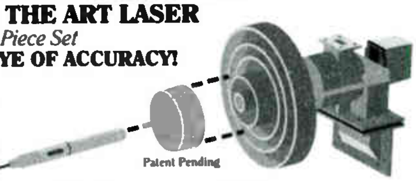
get converted!

LASER FOCUS FINDERS



STATE OF THE ART LASER
3 Piece Set
TRY THE EYE OF ACCURACY!

ALSO AVAILABLE
MANUAL FOCUS FINDER
WITH ADJUSTABLE
60 INCH EXTENDED ROD



THIS PRODUCT WAS DESIGNED FOR BOTH *COMMERCIAL and HOME OWNERS* USE OF SATELLITE INSTALLATIONS

Now Available for C & KU Band:

- Chapperal
- Cal-Amp
- Fujitsu
- Most Others
- Channel Master
- ADL
- Astro
- All duplicates

Powered by two "AAAA" cells battery bright red dot projected by the unit is clearly visible in excess of fifty metres in daylight or darkness. Measuring 150mm in lg. 10mm in diameter, weight 60 grams.

Satellite Home Owners For Best Picture Performance Feed Must Be Centered. Save On Service Calls With The Focus Finder

SETS UP EVERY DISH RIGHT!

PRICE
LASER PEN ONLY
LASER PEN WITH CAPS

P.O. Box 14115 • St. Paul, MN 55114
PHONE (612) 646-4700 • FAX (612) 641-1898

GREAT LAKES CABLE TV SERVICES, INC.

BUYING & SELLING
Quality Used & Surplus
CATV Electronics, Passives
Head-end & Test Equipment
219-234-8662
800-383-8046 FAX 219-232-1562

MAIN LINE EQUIPMENT, INC.

National Distributor for
PATHMAKER — TEXSCAN

WE BUY: Used Converters
Used line gear

WE SELL: Refurbished Converters
Line Gear

WE REPAIR: Converters & Line Gear

Distributor of Eagle Traps

1-800-444-2288
FAX:310-715-6695
Los Angeles • Atlanta • Spokane

COAST CATV SUPPLY

IN STOCK
NEW & REFURBISHED
Amps, LE's, Taps, Splitters
Connectors & Headends
ALL BRANDS 270 TO 550 MHz
Call for updated price list

We Buy: WANTED
ALL BRANDS
YOUR USED OR EXCESS EQUIPMENT
Fax your used/excess list
714-272-2360 Fax: 714-272-3032

LIQUIDATION SALE

Hamlin MCC 3000 as is 50¢ each
Reconditioned $10.00

WANTED
Jerrold DRX-3-DIC
SA 8550 & 8580

CABLE EQUIPMENT BROKERAGE CO.
818-709-3724
FAX 818-709-7565

CONSISTENT AUDIO LOUDNESS, LESS THAN $200 PER. CH. NEEDS NO NEW RACK SPACE, INSTALLS INSTANTLY!*

XL90 AUDIO CONTROLLER SETS TRUE AUDIO LOUDNESS TO WITHIN 0.5 DB, CHANNEL TO CHANNEL, EVEN WHEN THE INPUT VARIES 30 DB. THIS MODULAR PRODUCT MOUNTS IN SECONDS TO THE BACK OF ANY CHANNEL MODULATOR - **ELIMINATES HEAD END REWIRING AND NEW RACK SPACE.** EACH XL90 IS **SELF-CONTAINED.** BUILT IN CALIBRATOR LETS YOU SET UP IN LESS THAN A MINUTE/CHANNEL RMS BASED CONTROLLER **ADJUSTS LOUDNESS INAUDIBLY** - WITHOUT ARTIFACTS SPECS INCLUDE **0.03% THD AND -85 DB S/N.** WILL NOT DEGRADE DESIRABLE AUDIO DYNAMICS MEASURES 5 7"W X 1"H X 3 2"D OPERATES FROM +/-18VDC ***UNDER $200 IN SMALL QTYS.** FOR MORE INFO CALL MATREX INDUSTRIES, 702-737-5420 OR FAX TO 702-735-8092 3 YEAR WARRANTY 30 DAY TRIAL

Of the over 20,000 *Communications Technology* magazine recipients, 14,992 are classified as engineering vice presidents, directors, engineers, and technicians.* For further information about reaching our readership call 1-800-325-0156.

* December 1991 BPA Publisher's Statement

"Test Equipment"

Reconditioned Wavetek, HP, Tektronix and more. Signal Level Meters, Sweep Systems, TDR'S, Power Meters, Spectrum Analyzers, Frequency Counters, Fiber Test Equipment, and much more. Guaranteed to meet/exceed manufacturers specs. 90 day warranty standard.

PTL Cable Service Inc.
PH/Fax: 407-747-3647
BUY-SELL-TRADE

Inventory Clearance Sale Pricing on Feed-Forward Equipment

For Sale in Original Boxes • Manufacture Warranty

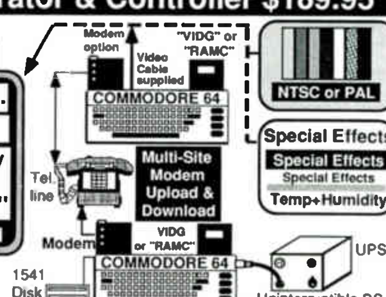
Magnavox Model Nos.
8T450HA-High Gain Feed Forward Trunk Amp
6T330-Power Doubling Trunk Amp

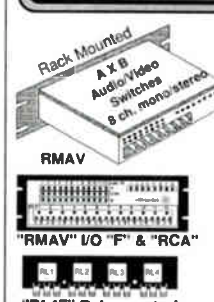
S/A Model Nos. (450 MHz)
280210-Bridger Amp Module
372397-Trunk Amp Module
372398-Trunk Amp Module

CALL 1-800-323-8166 ext. 2827
Ask for Chuck Chajet

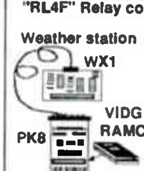
Video Page Generator & Controller $189.95

Low Cost Hi-Res
"Video Poster"
2-240 Char. crawls/ pg.
Flash, 9 Letter Sizes
16 Colors,User friendly
Auto-sequence pages
Cut & Paste,"WYSIWG"
12:24:30 THURSDAY 3:21:92





*Hi Res state of the art Video Page Generator
*Sequence more than 1000 pages (with disk drive)
*16 colors, 9 sizes, Crawl, Flash, Special effects
*Two (240 letter) variable size crawls per page
*Accurate real time clock & date any location
*Autoboots your sequence if power fails
*Low cost easy to find C64 computer (NTSC out)
*50 Time and date "Macro" event control commands
*Automate commands & events by time and date
*Upload & Download pages+commands via modem
*Controls model "RMAV" & external relays + VCR's
*User friendly, includes demo disk with help pages
*Generate NTSC color bars + message crawl lines
*Model "VIDG" EPROM program cartridge $189.95.



Model * Price * Description of "VIDG" Video Poster Options:

"RAMC"$289.95; "VIDG" Inc. Lithium Battery backed 52 page RAM-disk
"UPS1" $279.90; battery backed switcher eliminate brownouts
"WX1" $189.95; Weather station (deg. C. & F.) + humidity
"PK8"" $159.95; controls 8 external relays + 2 "WX1" inputs
"1541" $189.95; disk drive stores 1000 or more pages
"RL4F" $199.95; 4-75Ω hi isolation (DC to 600 Mhz) AXB switch
"RMAV"$ CALL; 2 to 8 75Ω "F" stereo or mono + video AXB switches
"C64" $159.95; Refurbished computer, with power supply
"Modem"$ 89.95; 1200 baud Hayes compatible

Engineering Consulting Tel: 714-671-2009 Fax: 714-255-9984
583 Candlewood St. Brea, Ca. 92621*Mastercard*Visa*Discover*Amex*PO*COD

ANTENNA
TECHNOLOGY

Be Ready for G-5 - 3.8m & 5.0m Antennas Available Now!

- Large Aperture Antennas - Both New & Used
- Parabolic Antennas from 1.8 to 32 Meters
- Satellite Spectrum Analyzer- New Design
- Parabolic Retrofit Systems
- Audio, Voice & Data Systems
- Earth Station Heating Systems
- Headend Electronics

Simulsat - America's Most Popular Multibeam!

The SIMULSAT multibeam, with its 70° view arc, views 35+ C & Ku-Band Satellites . . . Simultaneously!

This Antenna Farm views just 13 Satellites

SIMULSAT SEES THEM ALL...

35+ C & Ku-Band Satellites Simultaneously!

1128 East Greenway - Mesa, AZ 85203
Phone: 602-264-7275 Fax: 602-898-7667

See us at the NCTA Show, Booth #1420 and the SCTE Show Booth #414. Reader Service Number 93

Fiber storage

Optical Networks International introduced its FiberLoop fiber-optic storage unit designed to accommodate extra lengths of fiber along aerial support strand. The product is said to permit establishment of installation practices concerning the storage of extra fiber and ensures installers do not violate the minimum bend radius of fiber.

The units can be attached at any location along the support strand and at splice locations to store and protect the fiber bend radius of extra lengths of fiber. At splice closures, the FiberLoops store the additional fiber needed to reach a splice vehicle. The design allows the units to be stacked for multiple cable applications and the products can be installed inside a headend equipment building to accommodate arrangement of equipment racks. In this case, the units can be mounted on the ceiling or equipment rack. Four design configurations are available. The Model FOSS-1 is used for single cable loop AT&T fiber with four to 48 fiber counts (10-inch bend diameter). The Model FOSS-2 is used for a dual cable loop AT&T fiber with four to 48 fiber counts (10-inch bend diameter). For larger fiber counts, the Model FOSS-100 was designed to handle AT&T fiber with 49 to 96 fiber counts and Siecor's armored cables of two to 60 fiber counts (Siecor fiber requires a 12-inch bend diameter). The Model FOSS-200 is used for AT&T fiber with greater than 96 fiber counts (16-inch bend diameter). This model also can be used for Siecor's armored fiber with 61 to 120 fiber counts (16-inch bend diameter).

Reader service #204

TDR

Riser-Bond Instruments introduced its Model 1220 time domain reflectometer. The unit has long-range readability to 65,000 feet (19,500 m) and high precision accuracy (±0.01 percent). It also has an exclusive automatic cursor placement feature, waveform storage/comparison, and a multi-level/function noise filter.

It can be used for troubleshooting aerial and underground cables as well as cables in conduits and behind finished walls. As well, the unit can be used for measuring cables on-the-reel and during new cable installations. Other uses include testing cables for shipping damage, cable shortages, cable usage and inventory management. The instrument is portable, weighing under 10 pounds.

Reader service #203

Light source

The LP-5100 series of LED light sources was introduced by Laser Precision Corp. The products are handheld, modulated LED light sources designed for field use. They operate at both continuous wave and modulated modes (270 Hz and 2 kHz). Single wavelength models are available at 850 nm and 1,300 nm wavelengths. Dual wavelength sources are available in 850/1,300 nm and 1,300/1,550 nm models. LP-5100 series light sources can operate up to 10 hours on fully recharged NiCad batteries. They also can be powered using the AC charger/adapter included with each source or run on alkaline batteries.

Applications include attenuation measurements using the CW mode, splicing, connectorization, end-to-end testing of installed links, and fiber identification using the modulated modes. Each model comes with an operator's manual, AC charger/adapter and a soft pack carrying case.

Reader service #202

Compatible set-tops

Scientific-Atlanta announced its Model 8600 addressable set-top terminals can now be used in certain Zenith and Jerrold scrambling systems. By being compatible with other scrambling systems, the unit can be installed without requiring the dual carrying of scrambled services.

In addition to compatibility, the unit has self-revealing menus and prompts in simple English. On-screen features (including channel name and number, time and mute) are said to upgrade older TV sets. Ordering and confirmation of pay-per-view (PPV) events appear on-screen and automatic on-screen notices remind subscribers when the PPV event is about to start. Other menu-driven on-screen features available when using the product include VCR programming up to eight events over 14 days, preselected favorite channels, parental control, sleep timer, on-screen volume control and large display with up to 240 characters per screen for messaging and up to 16 pages per message. Video baseband and RF sync suppression scrambling techniques provide more than 100 different modes of scrambling. Operators can reserve maximum levels of random video and sync inversion for the most valuable premium and PPV programming.

Reader service #189

Fiber microscope

Noyes Fiber Systems introduced the Model OFS 300 fiber-optic inspection microscope. It offers 200x precision optics for viewing polished fiber connectors or cleaved fiber ends. It uses the company's universal adapter mount to interface all commonly available fiber connectors to the instrument.

The product features backlighting and battery operation or AC adapter input. It also has a tripod mount for laboratory use.

Reader service #198

Sweep system

New from Avatron is a low-level sweep system including the Model AT60G sweep reference test generator and a Model AT60R sweep/spectrum analyzer. The microprocessor-controlled system uses the company's patented low-level sweep technology that allows true continuous sweeping with real-time display.

The sweep/analyzer can be programmed to facilitate manual measurements, make decisions, perform calculations, interact with the operator and is fully compatible with the company's Model CR/CT4000 sweep systems. A built-in frequency counter provides the capability to measure modulated video and audio carriers as well as 4.5 MHz intercarrier spacing. Microprocessor power adds storage capabilities for up to 64 control settings and 100 documented measurements recorded in non-volatile memory for later viewing, printing or transferring to a personal computer. The technician sees things as they happen using continuous non-interfering sweep without loss of resolution. A RS-232C communication port is included for data transfer and remote system monitoring capabilities.
Reader service #197

Digital tuners

Jerrold announced its DCR-3000 tuners will have aesthetic changes so Digital Cable Radio subscribers can enjoy an enhanced look that is said to blend seamlessly with home entertainment systems. According to the company, the tuners' dimensions have been maintained. The company also reported that future models will incorporate a six-pin Molex connector digital output port for interfacing with digital tape machines.
Reader service #196

Spectrum analyzer

The new Model FSM spectrum analyzer from Rohde & Schwarz has >100 dB intermodulation-free dynamic range and a low-noise floor that is typically -142 dBm (6 Hz BW) at 26 GHz, according to the company. Signals of interest can be captured without the introduction of spurious frequency components over the full 100 Hz to 26.5 GHz range.

Accuracy and low phase noise are attained through fundamental mixing using an integrated diplexer, six-stage tracking filter and mixer together with a spectrally pure synthesizer. The company says the quasi-continuous, variable resolution bandwidth and dynamic, multivariable correction techniques facilitate fast sweeps with flat frequency response. AM and FM demodulators with calibrated outputs provide full modulation analyzer capability. The product can make manual and automatic test routine measurements. Results are viewed on a high-resolution color monitor with grids, test curves, parameters and markers. The on-screen display range is 110 dB.
Reader service #195

BERT system

The Model 110/210 gigabit bit error rate test (BERT) system was intro-

Reader Service Number 94

duced by Broadband Communications Products. It is said to be ideal for testing digital communications links and components at rates from 10 Mb/s to over 1.1 Gb/S. The Model 110 data sequence generator and the Model 210 error detector make up the system. Each unit is 5x12x12 inches and weighs 15 pounds.

Three selectable PN sequence lengths of 2^7-1, 2^{15}-1 and 2^{22}-1 are provided. Clock-to-data phasing can be adjusted in 200 ps steps within a 1.2 ns range in both the generator and detector. Both single error insertion and constant 10^{-3} bit error insertion are available for system verification. Four error calculations are made continuously and include total errors, error rate, percent error-free intervals and errored intervals. The detector has a GPIB interface for data acquisition and control.
Reader service #194

Oscillator

Piezo Crystal Co. announced the availability of its Model 2900082 oscillator. It uses the company's SC cut crystals. The frequency range is from 4 to 15 MHz.

Typical phase noise at 10 MHz is -110 dBc/Hz at 10 Hz, -140 dBc/Hz at 100 Hz, -160 dBc/Hz at 1 kHz, and -165 dBc/Hz at 10 kHz. The aging rate at time of shipment is $5x10^{-10}$/day. Frequency stability is $\pm1x10^{-8}$ over a temperature range of -40° to 70° C. Vibrational sensitivity is $1x10^{-9}$/g.
Reader service #191

Cable locators

The Path Finder 8840 and Path Finder 8850 portable locators are new from Rycom Instruments. They are designed to identify buried cable or pipe. Features of the products include ABS plastic construction, a one-piece receiver design with built-in probe, a peak/null meter with audio tone and an automatic transmitter load matching.

The units are powered by alkaline batteries. Both models have low frequency conductive coupling. The Model 8850 has the capability of high frequency inductive coupling and an optional flexi-coupler.
Reader service #193

FO talk set

Meson Design & Development's DB-118 LANTALK fiber-optic talk set uses a single fiber and can be operated with its headset or through a built-in mike and speaker. It can be voice-operated or used in a push-to-talk (PTT) mode. Combined with the firm's JU-414 bare fiber adapter, the talk set can be used from the onset of an installation.
Reader service #192

NEW
THE LAST PASSIVE

- 1 GHz.
- 15 Amp Power Passing
- 20 dB Return Loss
- Motherboard Design For Non Disruption Of Service
- Non Corrosive Hinged Zinc Housing With Chromate Finish

FOR YOUR CLOSEST DISTRIBUTION CENTER

Call: 1-800-465-7046

Reader Service Number 95

CALENDAR

1992

May

12: SCTE Cascade Range Chapter seminar. Contact Cynthia Stokes, (503) 230-2099.

12: SCTE Desert Chapter, BCT/E and Installer exams to be administered. Contact Chris Middleton, (619) 340-1312, ext. 258.

12: SCTE New York City Chapter seminar, fiber measurement, Time Warner, Flushing, N.Y. Contact Rich Fevola, (516) 678-7200.

12-13: SCTE Ohio Valley Chapter seminar, BCT/E Category II, "Video and audio signals and systems," and Smart House, Cincinnati (12th) and Cleveland (13th). Contact Jon Ludi, (513) 435-2092.

12-13: SCTE West Virginia Mountaineer Meeting Group seminar, OSHA and safety, Ramada Inn, Charleston, W.V. (12th) and Holiday Inn, Clarksburg, W.V. (13th). Contact Joe Jarrell, (304) 522-8226.

12-14: Magnavox CATV mobile training seminar, San Francisco. Contact Patricia Morgenstern, (800) 448-5171 or (800) 522-7464 (in New York state).

13: SCTE Cascade Range Chapter, BCT/E exams to be administered in all categories, Paragon Cable, Portland, Ore. Contact Cynthia Stokes, (503) 230-2099.

13: SCTE Florida Chapter, BCT/E exams to be administered in all categories at the technician level, Continental Cablevision, Pompano Beach, Fla. Contact Pat Skerry, (904) 735-1571.

13: SCTE Great Plains Chapter seminar, coax/fiber upgrades, fiber-to-the-feeder and future applications, Crown Court Quality Inn, Bellevue, Neb. Contact Jennifer Hays, (402) 333-6484.

13: SCTE Oklahoma Chapter seminar. Contact Arturo Amaton, (405) 353-2250.

13: SCTE Magnolia Meeting Group seminar, compression technology and coaxial cable characteristics, Ramada Inn Coliseum, Jackson, Miss. Contact Steven Christopher, (601) 992-0445.

14: SCTE Mid-South Chapter seminar, digital compression, Howard Johnson's, Senatobia, Miss. Contact Scott Young, (901) 365-1770, ext. 4150.

14: SCTE Penn-Ohio Chapter seminar, safety, Sheraton Hotel, Warrendale, Pa. Contact Bernie Czarnecki, (814) 838-1466.

14: SCTE Satellite Tele-Seminar Program, earth station site planning. To air from 2 to 3 p.m. ET on Transponder 6 of Galaxy I. Contact SCTE, (215) 363-6888.

14: SCTE Wheat State Chapter, BCT/E exams to be administered in all categories, Red Coach Inn, Wichita, Kan. Contact Mark Wilson, (316) 262-4270.

14: NCTI seminar, highway safety, Denver. Contact (303) 761-8554.

16: SCTE Golden Gate Chapter, BCT/E exams to be administered, Viacom, Pleasanton, Calif. Contact Michael Gorin, (510) 534-3364.

16: SCTE Cactus Chapter seminar, CLI and broadband test equipment. Contact Harold Mackey (602) 358-5860, ext. 135.

17-18: SCTE Old Dominion Chapter seminar, Holiday Inn, Richmond, Va. Contact Margaret Davison, (703) 248-3400.

18: SCTE North Country Chapter, Installer exams to be administered, Sheraton Midway, St. Paul, Minn. Contact Bill Davis, (612) 646-8755.

18-20: New York State Commission on Cable Television and **SCTE** Technology Update '92 (18th annual northeast technical seminar and trade show), Roaring Brook Ranch, Lake George, N.Y. Contact Al Richards, (518) 474-1324.

18-21: Siecor seminar, fiber installation, splicing, maintenance and restoration for CATV, Siecor Training Facility, Hickory, N.C. Contact (800) SIECOR 1, ext. 5539.

18-22: ONI Fiberworks '92 seminar, ONI Training and Product Development Center, Englewood, Colo. Contact Ray Reynard, (800) FIBER ME.

18-22: Hughes seminar, AML microwave equipment for local signal distribution. Contact (310) 517-5633.

19: SCTE Chattahoochee Chapter seminar, satellite communications, Perimeter North Inn, Atlanta. Contact Hugh McCarley, (404) 843-5517.

19: SCTE Southeast Texas Chapter seminar, fiber-optic design and maintenance, Warner Cable office, Houston. Contact Rosa Rosas, (409) 646-5227.

20: SCTE Bluegrass Chapter seminar, BCT/E Category VII, "Engineering management and professionalism." Contact Liz Robinson, (606) 299-6288.

20: SCTE Central California Chapter, seminar, BCT/E Category II, "Video and audio signals and systems." Contact Jim Robinson, (209) 835-4037.

20: SCTE Dixie Chapter seminar. Contact Scott Peden, (904) 968-6959.

20: SCTE Gateway Chapter seminar, basics of fiber optics, fiber system design, fiber splice enclosures and fiber test equipment, Joe Hannon's Restaurant, Maryland Heights, Mo. Contact Chris Kramer, (314) 949-9223.

20: SCTE Greater Chicago Chapter seminar, construction. Contact Bill Whicher, (708) 362-6110.

20: SCTE Michiana Chapter seminar, Turner's American, South Bend, Ind. Contact Russ Stickney, (219) 259-8015.

20: SCTE Mount Rainier Chapter seminar. Contact Sally Kinsman, (206) 938-8787.

20: SCTE Piedmont Chapter seminar, BCTE Category V, "Data networking and architecture," PCNs, telco bypass and office-to-headend data ties, Charlotte, N.C. Contact Tod Dean, (919) 757-0279.

21: SCTE New Jersey Chapter vendor fair (tentative). Contact Jim Miller, (201) 446-3612.

21: SCTE Heart of America Chapter seminar, fiber technology. Contact Don Gall, (816) 942-3715.

26-28: Magnavox CATV mobile training seminar, San Francisco. Contact Patricia Morgenstern, (800) 448-5171 or (800) 522-7464 (in New York state).

27: SCTE Southern California Chapter seminar, safety and risk management. Contact Tom Colegrove, (805) 251-8054.

Planning ahead

June 14-17: SCTE Cable-Tec Expo '92, San Antonio, Texas. Contact (215) 363-6888.

Sept. 8-10: Eastern Cable Show, Atlanta. Contact (404) 252-2454.

Sept. 15-17: Great Lakes Cable Expo, Cleveland. Contact (517) 482-9350.

Oct. 13-14: Atlantic Cable Show, Atlantic City, N.J. Contact (609) 848-1000.

Dec. 2-4: Western Cable Show, Anaheim, Calif. Contact (415) 428-2225.

SCTE remembers the Alamo!

By Wendell Woody
President, Society of Cable Television Engineers

Don't be overrun for lack of adequate technology ... "Remember the Alamo!" Maintain your communications link for all the new emerging technologies ... "Remember the Alamo!" Training for survival ... "Remember the Alamo!" SCTE Cable-Tec Expo '92 ... "Remember the Alamo!"

CATV industry technical leaders, engineers and technicians are all massing in great force to move on the Alamo in June. Thereupon, they will attend this year's SCTE Engineering Conference at the San Antonio Convention Center in Texas.

The conference will open with a dynamic panel on digital compression exploring expanding channel capacity while enhancing video and audio quality. Then all the great technical "generals" from Washington D. C., will address CATV technical compliance and how Federal Communications Commission reregulation will impact your system operations and maintenance practices.

With the industry focus on customer service, a panel of delegates from state cable commissions will expound on how our industry is meeting the subscriber expectations. For a better today and a look into the future the panel session titled, "Current events in cable TV technology: Fiber optics, HDTV, PCN and outage reduction" will be most inspiring.

Expo workshops

Once again, there will be six workshop periods and 10 workshops to choose from in planning your schedule. This year's workshop subject materials are all new, exciting and most timely. Here they are for your review: "Assessing your system's picture quality"; "BCT/E certification — An overview of technical certification and related category examinations"; "The best of Fiber Optics Plus '92"; "Customer Service — Doing the job right the first time"; "EBS and the cable industry"; "How will the new NEC, NESC and OSHA regulations impact your system?"; "One-on-one with the FCC"; "Outage reduction techniques"; "Primary testing under technical reregulation"; and "Secondary testing under technical reregulation."

Pre-meetings

Arrive early! On Friday, June 12, the National Cable Television Association Engineering Committee will meet from 9 a.m. to 6 p.m. On Saturday, June 13, NCTA will sponsor a seminar on "Reregulation of Technical Standards." It is scheduled from 9 a.m. to 5 p.m. Both meetings will be at the convention center. Pre-registration for the seminar is mandatory and seating is limited to the first 300 applicants. Call the NCTA at (202) 775-3639 for more information.

Post-meetings

Stay late! On Wednesday morning, June 17, four of the SCTE engineering subcommittees will meet. In-Home Cabling (wiring) and Emergency Broadcast System (EBS) subcommittees' meetings are scheduled from 7:30 to 9:30 a.m. Interface Practices and Cumulative Leakage Index (CLI) subcommittees' meetings are scheduled from 9:30 to 11:30 a.m. You will be able to attend portions of all four or two of them in their entirety. Make sure your travel schedule will accommodate your attendance at these meetings. BCT/E and Installer Certification testing also will be conducted on Wednesday morning from 8:30 a.m. to 12 p.m.

National Cable-Tec Games

The second National Cable-Tec Games will be featured during Expo Evening. The Games are a competition among CATV system personnel centering around technical tasks and knowledge. After each event, points are awarded by the judges for each contestant based on speed, accuracy and performance parameters. First, second and third place Olympic-style individual medals are presented to the winner of each event. The event is supported by a national SCTE subcommittee (chaired by Ron Wolfe of ATC Training Center in Denver). He can be reached there at (303) 753-9711 for more details.

Welcome new directors

Re-elected to seats on the national SCTE board were: Tom Elliot, TCI (at-large); Jack Trower, WEHCO Video (Region 8); Mike Smith, Adelphia Cable (Region 10); and Walt Ciciora, ATC (Region 12). New board directors to be seated at our June meeting in San Antonio are: Norrie Bush, Columbia Cable (Region 3); Wayne Hall, Warner Cable (Region 4); Mark Wilson, Multimedia (Region 5); and Terry Bush, Trilithic (Region 7). Join me in welcoming these new directors aboard. Congratulations to all election winners.

Meeting the members

"The state of the industry" was the program title for a recent Greater Chicago Chapter meeting. The guest speakers were: The Honorable Dennis Hastert, U.S. Representative, Illinois; Gary Maher, president, Illinois Cable Television Association; Russell Monie, FCC regional director, Chicago; Chris Scott, general manager, Jones Intercable; and I represented the SCTE as president. Chapter officers supporting the program were: Bill Cohn, Kevin Walker, Bill Whicher, Nick Theroux, Bob Runchy, John Grothendick, Wes Schick, Jason Shreeram, Joe Thomas, Brian Hurd, Bob Hill and John Fedorky.

The SCTE was pleased to develop and conduct the technical program for this year's North Central Cable Show. We had technical panels, an OSHA safety session, BCT/E testing and followed with a two-day "Technology for Technicians" seminar by SCTE's Ralph Haimowitz. We certainly appreciated the assistance and support from the officers of the SCTE North Country Chapter: Bill Davis, Kelly Booth, Lanny Sparks, Matt Haviland, Jimmy Schulz, Scott Gunderson, Scott Melter, Wes Schick and SCTE Region 6 Director Rich Henkemeyer.

SCTE meetings and functions were most successful at both the Texas Cable Show and the L'ARK Show in New Orleans. We acknowledge the excellent membership support from Lee Anderson, Darrell Eichelberger and Jim Wood from the Ark-La-Tex Chapter; Terry Blackwell, Mark Webb and national Director Les Read from the North Central Texas Chapter; Rosa Rosas and Tom Rowan from the Southeast Texas Chapter; Charles Thibodeaux, Leroy Naquin, and Kevin Smith from the Miss/Lou Chapter; and Bob Griffith from the new Ozark Mountain Meeting Group. **CT**

PAWS™ are coming

PORTABLE ACCESS WORK STATIONS™

Another work of ART™ from the Cheetah™ people

Automated Remote Testing™

WE MEASURE THE BEST!™

Cheetah™

SUPERIOR ELECTRONICS GROUP, INC.
2237 Industrial Boulevard, Sarasota, Florida 34234
Telephone (813) 351-6700 • Fax (813) 351-9193

See us at the NCTA Show, Booth 1200. Reader Service Number 96

What do all SA distribution products have in common?

They're all in Anixter Cable TV's inventory.

Scientific Atlanta + ANIXTER CABLE TV

Atlanta, Georgia
(404) 840-7901 • (800) 242-1181
Anaheim, California
(714) 779-0500 • (800) 854-0443
Chicago, Illinois
(708) 350-7788 • (800) 544-5368

Cleveland, Ohio
(216) 526-0919 • (800) 321-8068
Dallas, Texas
(214) 446-CATV • (800) 231-5006
Denver, Colorado
(303) 740-8949 • (800) 841-1531

Iron Mountain, Michigan
(906) 774-4111 • (800) 624-8358
Seattle, Washington
(206) 838-9552 • (800) 438-9290
Wharton, New Jersey
(201) 328-0980 • (800) 631-9603

© 1992 ANTEC

See us at the NCTA Show, Booth #1614. Reader Service Number 97