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April 1984
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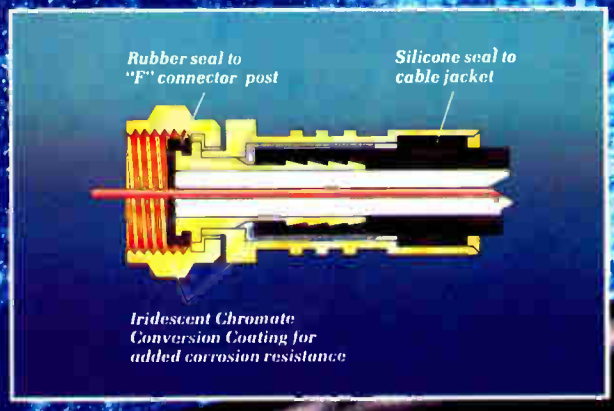

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Reader Service Number 2

CED™

April 1984

COMMUNICATION NEWS 18

Tec Expo emphasizes education, training

Nashville, Tenn., was the site of the second annual SCTE convention and trade show, featuring some 80 vendor booths, afternoon workshops and morning technical sessions.

INTERFACE 22

Scientific-Atlanta courts minicable market

S-A puts together a package of commercial quality, low-cost products aimed specifically at non-franchised cable operators.

FEATURE 26

Training: Building a strong foundation

Industry managers and engineers are worried about the troops. Losses caused by inadequate training are rising and the outlook isn't expected to improve as technology becomes more complicated. Bob Luff of United Artists Cablesystems Corp. and Ralph Haimowitz, CATA's chief engineer, sound off on the problems with training.

FEATURE 30

Construction problems: Tips for a smooth build

Cable operators around the country talk about the biggest headaches they've encountered in construction and how they've overcome the obstacles. Railroad right-of-way, dealing with the telcos, money and manpower are a few of the topics. Railroad officials offer tips to speed the right-of-way application process. A Mountain Bell official talks about ways for telcos and cable companies to communicate better.

FEATURE 32

Rebuilds: Avoiding unexpected problems

Technicians disclose what they wish they'd done before they began their rebuilds. From Florida to Oregon, the responses range from lack of adequate planning to not receiving equipment when needed. Associate Managing Editor Constance Warren's article surveys the people who've already rebuilt and finds that nearly all have suggestions for those anticipating a rebuild situation.

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Fiberoptics vs. coaxial

Associate Editor Gary Kim focuses on Times Fiber's Mini-Hub and how the company redesigned the system into the Mini-Hub II. Kim weighs the advantages and disadvantages of fiberoptics and calls on experts such as Robert Shack, manager for private networks at Byers Communications Corp., for inside assessments..

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Construction chart

CED's annual construction chart provides a listing of all the cable construction hardware manufacturers as well as a 10-year construction expenditure analysis and cost projection for 1984.

PRODUCT PROFILE 54

Trenchers and plows

CED takes a look at the trenchers and plows being used in the cable industry today. A detailed listing of the machines and specifications are presented.

About the cover

Margaret DeLuca photographed this month's cover illustration of a Cable West crewmember, working on the Scripps Howard Cable Systems build in the Loveland, Longmont, Lafayette, Colo. area.

Tom Polis, president of SCTE, and friends kick off the second Cable-Tec Expo, held in Nashville, Tenn., March 5-7. See page 18.

This month's Product Profile features trenchers and plows. Ditch Witch's 255SX plow is presented above.

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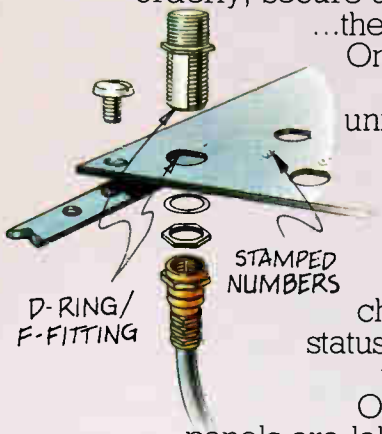

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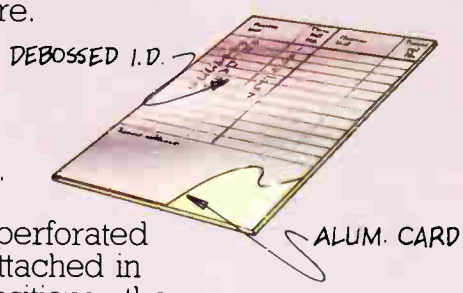

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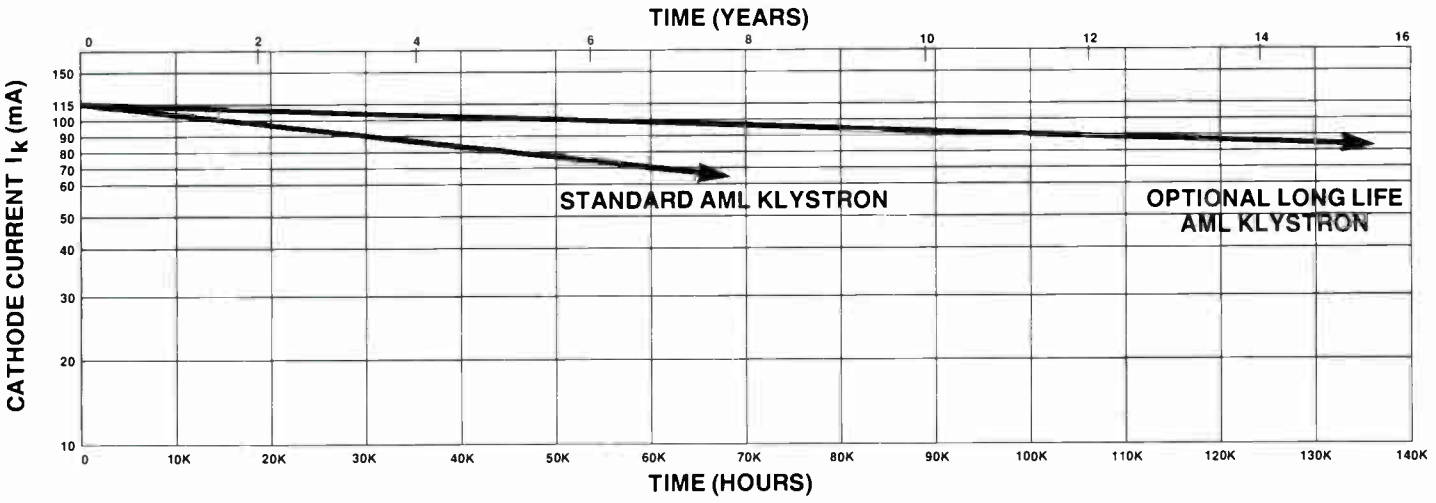

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Reader Service Number 5

GI names new head, concludes TOCOM agreement

General Instrument and TOCOM have concluded a definitive agreement under which the Texas-based converter supplier will become a subsidiary of GI. TOCOM shareholders will receive $3 in market value of General Instrument common stock for each of TOCOM's 8 million outstanding shares. However, that amount may be dropped by as much as 60 cents per share, depending on the outcome of an audit of TOCOM financial statements through March 31. GI has agreed to loan TOCOM up to $4.4 million prior to the closing of the deal, which is expected in mid-May. GI already has loaned TOCOM $5.3 million. TOCOM, in turn, has granted GI a license to make its addressable baseband converters. Another change at GI concerns the appointment of C.M. Chang as president and COO. He most recently served as senior vice president of Texas Instruments and is a 25-year executive veteran with that company. Frank Hickey will continue as chairman and chief executive of GI. GI also announced the executive committee of the board of directors' decision authorizing the company to repurchase up to 100,000 shares of its common stock. The acquired stock will be used as part of the common stock that will be swapped for shares in TOCOM Inc., under the proposed merger agreement between the two firms concluded two weeks ago.

Cable firms seek damages from Tandy

Lawyers for Tandy Corp. and two Pennsylvania cable systems brought arguments in a class-action lawsuit before U.S. district court in Pittsburg. The suit, filed by Shenango Cable TV and Variety Cable TV, a pair of independent operators whose systems cover about 17,000 subscribers in the towns of Hermitage and Sharon, Pa., cited Tandy's Radio Shack division as being in violation of a Communications Act section banning unauthorized interception of interstate communications—in this case, violating the section by selling block converters. Shanango and Variety Cable are asking district court to place an injunction on Tandy, and seek monetary damages. Officials from the cable systems and Tandy declined to comment on the case. A decision is expected within 60 to 90 days.

Byers agrees to merge with Celwave

Byers Communications Systems Inc. has agreed in principle to merge with Celwave Technologies Inc., a North Carolina based manufacturer of fiberoptic cable, telephone copper wire and cellular radio antennas. Under the proposed terms, Byers would exchange 2.2 million of its pre-split common shares for Celwave's outstanding capital stock. At current prices, the acquisition would be valued at some $45.7 million. The new company would use the name "ByCom Systems Inc.," pending shareholder approval. However, Celwave's products would continue to bear the Celwave name. A definitive agreement should be ready by late April, according to Walter Jones.

General Cable
CATV Division

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800-526-4385 or 201-636-5500

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Reader Service Number 6

Seminars

April

1-3: The annual convention of the **Virginia Cable Television Association** will be held at the Williamsburg Lodge in Williamsburg, Va. Contact Dick Carlton or Lorraine Whitmore, (804) 358-7060.

2-3: Philips Publishing Inc. will present "New Opportunities in Local Wideband Networks." The conference, also cosponsored by **Kalba Brown Associates Inc.**, will be held in Arlington, Va. Contact Phillips Publishing, (301) 986-0666.

2-3: TeleStrategies will present a seminar on "Understanding Telecommunications Technologies for Non-Engineers" at the Hyatt Regency in Chicago. Contact TeleStrategies, (703) 734-7050.

3-4: A videotape editing seminar sponsored by **JVC Co. of America** and **Convergence Corp.** will be held in Nashville, Tenn. Contact Caren Tauber, (212) 244-5225.

3-5: An International Teleconference Symposium—sponsored by **AT&T, Comsat, ITT World Communications, MCI International, RCA Global Communications, Satellite Business Systems** and **TRT Telecommunications Corp.**—will be held in Philadelphia. Contact (800) 521-0810.

4-6: The RF Systems Division of General Instrument will hold a seminar on "BroadCom System Technology" in Mississaga, Ontario, Canada. Contact Joanne Wilcox, (602) 294-1600.

3-5: Test & Measurement World Magazine will sponsor their third annual Test & Measure ment World Expo, to be held at Brooks Hall, San Francisco. Contact Test & Measurement World Expo, (617) 254-1445.

6-7: The annual spring **Iowa Technical Seminar** will be held in Ames, Iowa. Contact Jean Hamilton, (515) 245-7566.

10-11: TeleStrategies will sponsor a Multi-Tenant Telecommunications, PBX Sharing and Teleports conference in Washington, D.C. Contact TeleStrategies, (703) 734-7050.

10-11: A videotape editing seminar sponsored by **JVC Co. of America** and **Convergence Corp.** will be held in Denver. Contact Caren Tauber, (212) 244-5225.

10-11: SATCOM '84, sponsored by the **International Association of Satellite Users**, will take place in Washington, D.C. Contact Donna McCaughey, (703) 437-5457.

10-12: A **Jerrold** technical seminar will be held in Dallas. Contact Kathy Stangl, (215) 674-4800.

11-12: A **Blonder-Tongue** SMATV/ MATV/ CATV/ TVRO technical seminar will be held at the Ramada Inn East, Reynoldsburg, Ohio. Contact Betty Karas, (201) 679-4000.

11-13 & 16-18: A **Magnavox** CATV Training Seminar will be held in Albuquerque, N.M. Contact Magnavox, (800) 448-5171.

16-18: Videotex '84, sponsored by **London Online Inc.** will be held at the Hyatt Regency in Chicago. Contact Lorraine Thelian, (212) 661-8001.

17: The Southern California Cable Association will hold a roundtable on "Quality Cable Operations in the Urban Marketplace" at the Los Angeles Airport Hilton Hotel. Contact the SCCA, (213) 684-7024.

17-18: A videotape editing seminar sponsored by **JVC Co. of America** and **Convergence Corp.** will be held in Miami. Contact Caren Tauber, (212) 244-5225.

17-19: The fourth in a series of six technical seminars sponsored by **C-COR Electronics Inc.** will be held in Columbus, Ohio. Contact Deb Cree, (814) 238-2461.

18-20: A **Community Antenna Television Association** basic technical training seminar will be held at the Best Western Airport Inn, Seattle. Contact (305) 562-7847.

23-25: The Louisiana Association of Cable TV Operators will hold its annual convention and trade show at the Baton Rouge Hilton. Contact LBM Enterprises, (504) 928-5604.

Seminars

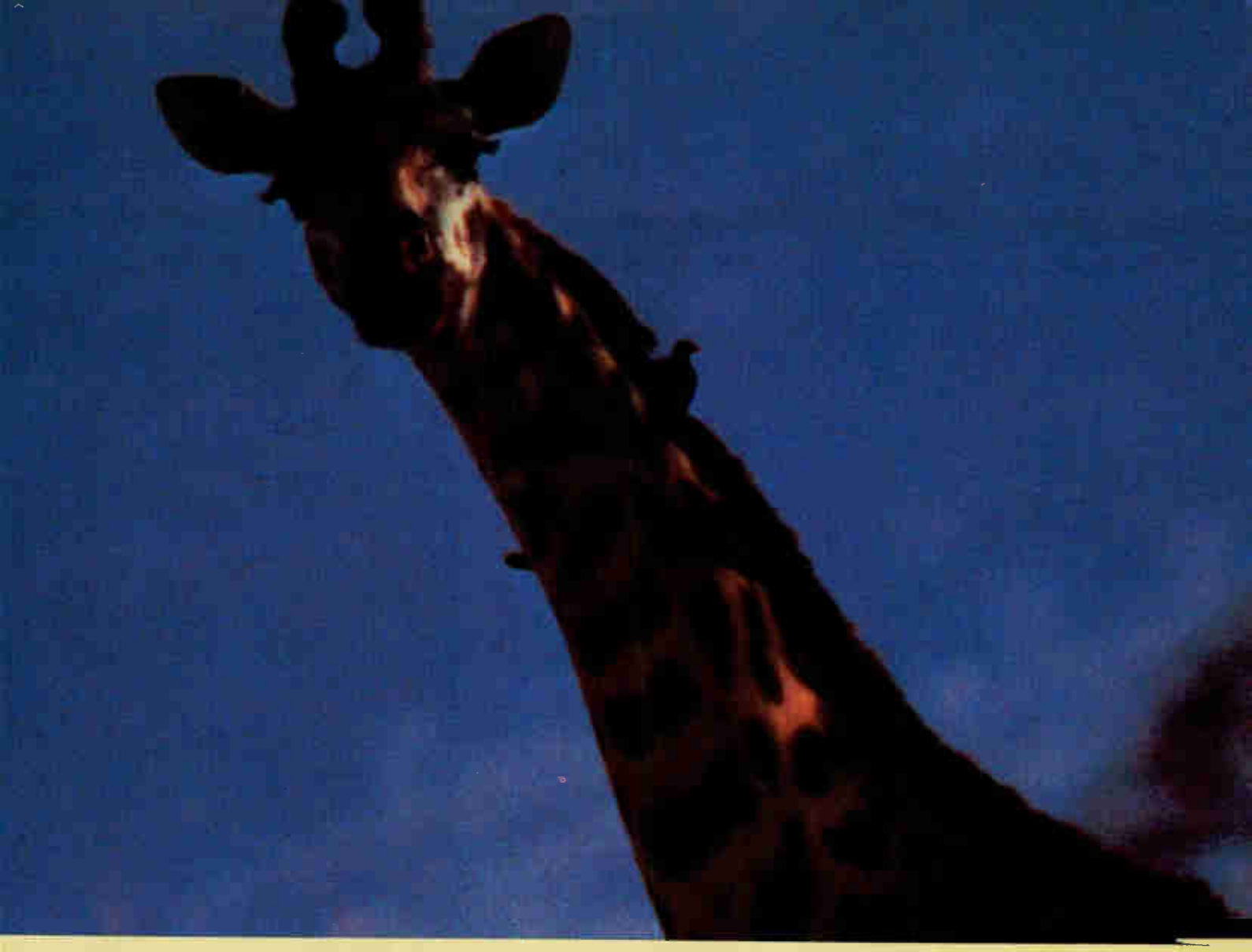
23-25: The **National Satellite Cable Association** and **Eagan & Associates** will hold a PC/ SMATV workshop in Chicago. Contact Larry Hannon, (904) 237-6106.
24-26: Scientific-Atlanta will hold a CATV product training seminar in Boston. Contact Vickie Gilleland, (404) 449-2127.
26-27: Microwave Filter Co. Inc. will sponsor a one-day terrestrial interference seminar on each day. Contact Bill Bostick or Carol Ryan, (800) 448-1666.
29-May 2: The **National Association of Broadcasters** will hold their annual convention in Las Vegas. Contact the NAB, (202) 293-3570.
30: The Rocky Mountain Chapter of **Women In Cable** will offer its second CableCourse at 8 p.m. at The University of Denver in Denver. Contact Roxanne Barlow or Dawna Hunka, (303) 321-7550.

May

1: An Executive Seminar on U.S. Government Applications for Fiberoptics Systems, sponsored by the **Kilty Company**, will be held at the Congressional Club in Washington, D.C. Contact Mildred Christian, (301) 657-3910.
1-3: ABC TeleTraining, Inc. will hold a comprehensive course in subscriber loop design, installation and maintenance in Birmingham, Ala. Contact ABC TeleTraining, Inc.,(312) 879-9000.
2-3: Frost and Sullivan will be sponsoring a Networking Personal Computers conference at the Halloran House in New York City. Contact Ginny Kania, (212) 233-1080.
5-9 EUROCAST '84 will take place in the halls of the Swiss Industries Fair in Basel, Switzerland. EUROCAST is sponsored by the **Society of Cable Television Engineers** and the **Swiss Association Satelliten Rundfunk.** Contact Mark Voss, (713) 463-0502.
6-9 Comunicaciones Expo '84, the only show dedicated to the Latin American and Caribbean Communications Market, will be held at the Curtis Hixon Hall in Tampa, Fla. Contact Gene Bignami or Martha Hammerquist, (617) 329-8090.
7: The **Rocky Mountain Chapter of Women in Cable** will offer its Cable Course at the University of Denver in Denver, Colo. Contact Roxanne Barlow or Dawna Hunka, (303) 321-7550.
7-9: The 1984 Sat Expo and Satellite Direct Conference takes place in Denver, Colo. The annual event is sponsored by **Channel Guide**. Contact Leslie Howard at (303) 761-1135 or (303) 761-7930.

Looking ahead

May 5-7: Eurocast '84, Basel, Switzerland.
May 9-11: A Community Antenna Television Association technical training seminar, Philadelphia.
June 3-6: National Cable Television Association convention, Las Vegas (Nev.) Convention Center.
June 11-14: Canadian Cable Television Association convention, Capital Congress Center, Ottawa.
July 15-19: Community Antenna Television Association convention, CCOS-84, Tan-Tar-A Resort, Osage Beach, Mo.
Aug. 12-15: Cable Television Administration and Marketing Society convention, Waldorf-Astoria, New York.
Sept. 6-8: Eastern Show, Georgia World Congress Center, Atlanta, Ga.
Oct. 16-18: Mid-America Show, Hilton Plaza Inn, Kansas City, Mo.
Oct. 30-Nov. 1: Atlantic Show, Atlantic City Convention Hall, Atlantic City, N.J.
Dec. 5-7: Western Show, Anaheim Convention Center, Anaheim, Calif.



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Reader Service Number 10

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Volume 10, No. 4

Avoiding headaches

As the cable industry moves toward an era of "maturity," many of the old problems seem to be making the sojourn also, particularly in the areas of training and construction. This month's issue focuses on those problems and offers some advice from experts inside and outside the industry on how to avoid common pitfalls.

Associate Editor Gary Kim examines the training issue and unearths some candid comments as well as some solid solutions. "Training, or more accurately, the usual lack of training, is a crime within the cable industry," says Bob Luff, United Artists Cablesystems Corp.'s vice president for engineering.

Ralph Haimowitz, Community Antenna Television Association's chief engineer, echoes Luff's sentiments and adds that problems could get worse as technology becomes more advanced. Signal leakage remains a major headache, and many technicians and engineers aren't even aware that they've been making improper signal level meaurements for years, Haimowitz says. "Ninety-eight percent of the technicians and engineers I talk to don't know how to translate raw leakage data and convert it to see if FCC specifications are being violated."

Haimowitz lauds United Artists, Viacom, ATC and Group W for their training programs and encourages management to "bite the bullet on training" and develop formal training centers. Luff considers ATC's National Training Center the best industry model available. Spend money up front for training, and the investment will pay off long term, is the general consensus.

On the construction scene, Managing Editor Frank Hogan surveys small system operators and technicians around the country to uncover construction problems and learn how they are being overcome.

Railroad right of way and dealing with the telcos were often-repeated concerns. "It's easier to cross the interstate highway than the railroad," says Alan Kilgore, president of Grove Hill Telecable in Alabama. The application process is tedious and often takes six weeks or longer before approval is given. And, railroad officials admit things aren't likely to change. Wat Gray of Citronelle Cable thinks the railroads move like sloths because they operate like they did 100 years ago. Illinois Central officials don't readily admit to antiquated operating methods when it comes to processing cable permits, but they do agree that "speed of handling (applications) is our most serious problem."

However, Illinois Central Officials did offer tips on how to cut through the maze of railroad bureaucracy and save a few dollars along the way.

Telco officials also were helpful in providing other-side-of-the-coin advice. Mountain Bell's Mike Markham offers some practical steps to achieve better telco/cable relationships, including the simple admonishment to read contracts closely.

Associate Editor Constance Warren completes this month's feature package with a timely piece on rebuild problems. Warren contacted technicians from Oregon to Florida for a first-hand account of what went wrong and right with rebuilds. Unexpected problems were the rule rather than the exception. Many techs advocated more pre-planning. Getting the total picture of what will be required in terms of hardware, manpower and implementation, before embarking on the rebuild project, is recommended strongly.

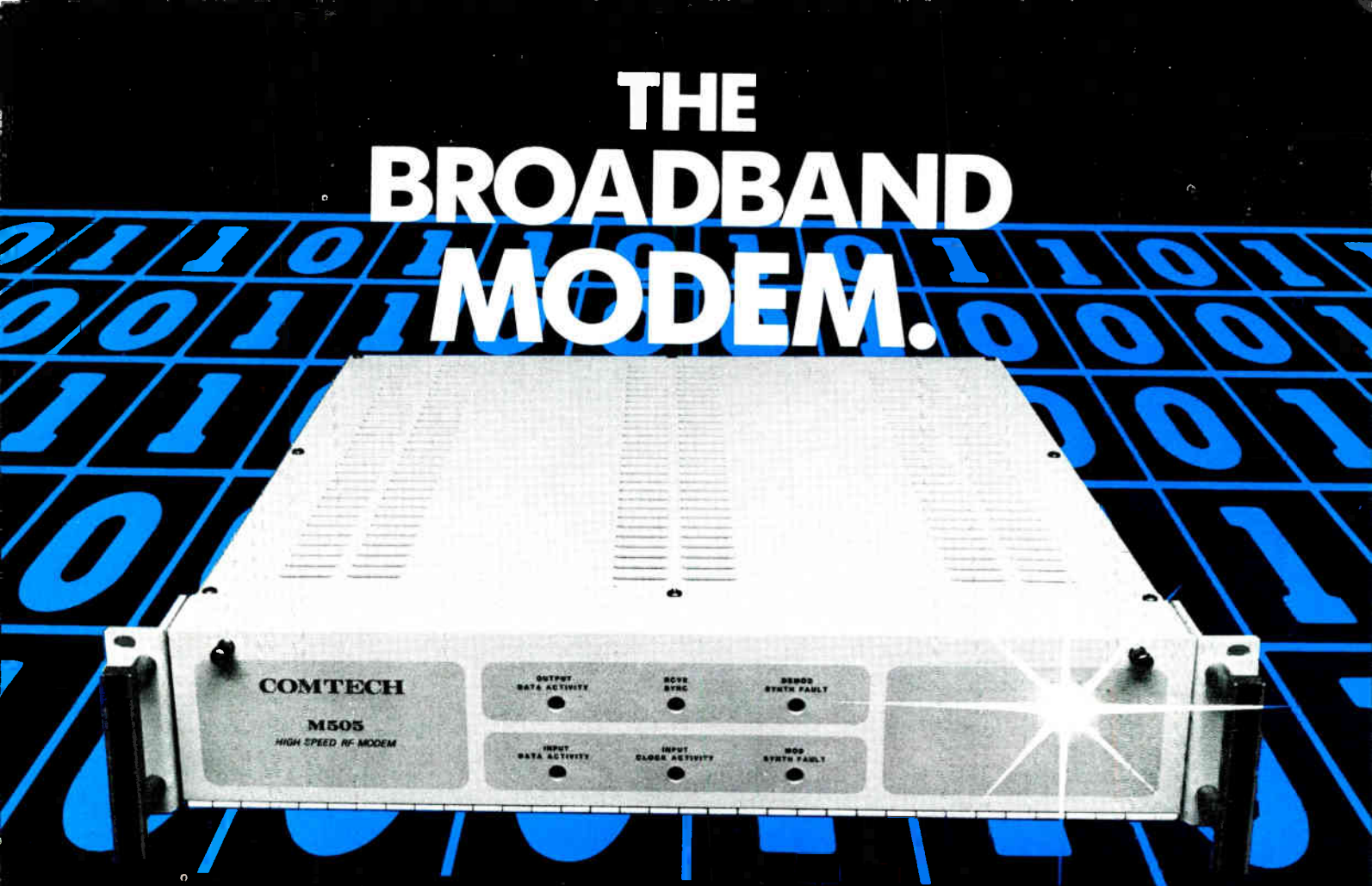
Anyone anticipating a rebuild should consider the responses Warren received to her two questions: What were the biggest problems you faced during rebuilding; and what measures did you implement to overcome the obstacles?

The SCTE's Cable Tec Expo '84 held last month in Nashville, Tenn., is also covered in this issue. The emphasis was on education and training and more than 1,100 attendees took advantage of the various exhibits and seminars.

Contributing Editor Gary Arlen's "Teledelivery" article assesses the impact of the possible CBS, IBM and Sears videotex venture on the cable industry. Arlen then focuses on the emergence of another hybrid system, Cabletex, which will offer a variety of services via a cable-telephone system. Cabletex hopes to begin a field test by year's end.

Our "Product Profile" features trenchers and plows. Also in "Tech II" is an examination of the fiberoptic vs. coax situation by Associate Editor Kim. Time's Fiber's Mini-Hub developments are profiled and the advantages and disadvantages of fiberoptics are discussed.

THE BROADBAND MODEM.



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Reader Service Number 11

SCTE's Tom Polis and Steve Cox and CED's Cathy Wilson participate in ribbon cutting ceremony to kick off Cable-Tec Expo '84.

Tec Expo emphasizes education, training

Workshops and floor exhibits stress importance of technical know-how

NASHVILLE, Tenn.—Technical training was the watchword as 1,100 registered delegates gathered under leaden skies March 5-7 for Cable-Tec Expo '84, the second annual convention and trade show sponsored by the Society of Cable Television Engineers.

As a prelude to the Expo, SCTE held its annual Spring Conference and membership meeting March 3-4. A wide variety of papers on technical and management topics were presented during the conference.

The emphasis on education and training was repeated on the convention floor. In addition to the 80 or so vendor booths, a number of afternoon workshops complemented the dozen morning sessions. Jerrold taught two seminars on addressability and feedforward. SCTE offered a management and performance appraisal workshop, while white-coated technicians operated an equipment test facility.

The convention floor was closed during the morning technical sessions to encourage attendance, but delegates needed little prodding to hear the workshop on FCC compliance led by Cliff Paul, former chief of the FCC's microwave division, and Chris Papas, FCC field engineer.

Both emphasized that the FCC is cracking down on operators who violate agency rules.

The growing importance of the multiple dwelling market was highlighted when Allen Kirby of AM Cable TV Industries talked about installation practices in high-rise apartments. Kirby provided do's and don'ts for everything from the selection of molding and placement of MDU boxes to cleanup procedures at the end of each workday.

Quality control procedures for installation crews was the subject of a talk by RT Cable Corp.'s Rick Thomas. Make sure your crews are up-to-date on the latest versions of the technical manuals, are careful about drops and understand customer service, he said. Fellow panelist Bill McKissock of Suburban Cablevision emphasized the importance of inventory control, grounding and product interfaces. Grounding to cold water pipes and charges for attaching cable-ready VCRs were recommended.

Other sessions dealt with aerial and underground construction; TVRO maintenance; amplifier fundamentals; test equipment and converters; feedforward; system design; digital electronics; and ham operators.

Bob Luff, vice president for engineering at United Artists Cablesystems Corp., underscored the importance of investments in human capital, as he lamented the industry's woeful inattention to training. "Management doesn't have any incentives to push training. It's a line item that people feel they can shave in a pinch, and it's a crime," he said.

"We aren't working with simple 12-channel systems any more," Luff said. "Things are a whole lot more complex, and as a result we're facing some new problems."

Previously, the system managers were the guys with the resources, Luff maintained. They could negotiate the franchises. Now there's been a flip-flop.

"Increasingly, it's the engineer who has the power," he said. "There's a real competitive market right now and it's been hard on the smaller systems, which can't afford to pay the salaries."

Luff recommended that managers avail themselves of the training that manufacturers are willing to provide. "All you have to do is call," he said.

Tec-Expo '84 was in some respects aimed at the unsung heroes of the industry: the engineers, technicians, installers, contractors and manufacturers whose job it is to keep the networks up and running. While their work may not be as visible or flashy as that of the programming side of the business, it is every bit as important to the industry's bottom line. For example, Pyramid Industries of Phoenix, Ariz.'s founders, Earl Gilbert and Paul Rhodes, have a number of industry firsts to their credit. They developed the first true 75 ohm connectors for the industry, the first auto-seize connectors and the radiation sleeve, Rhodes said. The industry's first feed-through connectors and the 6262 series aluminum alloy are other innovations the two are responsible for.

—Gary Kim

Longmont makes history with SCADA

LONGMONT, Colo.—Longmont Communications Cable, a Scripps-Howard cable company, recently made history by becoming one of the first cable systems in the country to operate an electricity monitoring and distribution management system successfully over its I-Net the end of February. This electricity monitoring system is known by the acronym SCADA, which stands

for Supervisory Control and Data Acquisitions.

Jeff Gould, chief electrical engineer for the Longmont Electrical Dept. (LED), the municipal electricity utility that owns the Longmont SCADA system, claims that "to our (LED's) knowledge, this is the only SCADA system in the country using coax as the data transmission medium." Other SCADA systems utilize the phone twisted pair or power lines as the communications link.

Gould cited three factors as responsible for LED's decision to use coax over other available transmission conduits. First, the operator's franchise agreement with the city enabled the electricity department to use the I-Net at a low cost Secondly, the reliability offered by the operator was "sufficient" and "real feasible," and thirdly, the timing of the operator's proposal was opportune. From its initial conception, the SCADA system took 1½ years to complete.

While SCADA is similar in concept to an energy load management service in that it controls electrical output, its principal beneficiary is the electrical utility and not the individual consumer. In addition to energy load control, SCADA can monitor the voltage and status of an entire electrical system in a given area and its meters.

Posed beside some headend gear is John Wilde, chief engineer for the Longmont, Colo., cable system operating the city's SCADA system.

The Longmont SCADA system consists of three substations connected to the main utility office via the city's I-Net mid-split bi-directional single coax network. The remote stations, located anywhere from three to 11 miles away from the LED central office, provide electricity for some 18,000 homes in a 30-square mile radius.

Fundamental to the SCADA system is a microprocessor and "intelligent" software program, designed by Moore

Systems Inc., a subsidiary of Landis and Gyr, that sends messages to one or more substations. Each substation is equipped with a microprocessor and complementary software package that can address return messages to the LED main office.

In between the substations and main office lies the Longmont Communications Cable headend and institutional network. John Wilde, chief engineer for the operator, says the system can carry the equivalent of 38 video channels within the forward spectrum and 16 channels on the reverse spectrum. Messages sent from the LED main office are transmitted on the 23.79 reverse frequency band to the headend, where a 3M 925 coax modem intercepts the message. At this point, the message is upconverted to the 216.04 forward MHz frequency and sent down the coax to the remote substation(s) for which it is intended. A 3M dual frequency 926 modem then receives the information at the substation and relays the data to the station's microprocessor, which interprets the command. Since the substation's microprocessor is designed to "configure with the electrical wires," it can monitor the voltage and overall status of the system and regulate the amount of electricity distributed from the substation.

Messages returning from the substation to the LED office are conveyed on the 23.79 MHz reverse frequency up to the headend and then upconverted to the 216.04 MHz forward band and transmitted to the LED office. There, the information is received by another 3M modem. According to Wilde, the I-Net is configured in such a way that no traffic jams occur, despite the absence of collision detection equipment. Such "jamming" is circumvented by a turn-on/turn-off technique, which uses a "pulsed" carrier, operating 24 hours a day, to synchronize the transmission of data so that no overloading of frequencies results.

Wilde said he "was not surprised" by the successful operation of the system. "The only thing I had a shadow of a doubt about," he explained, "was the actual 3M product," which has proven reliable.

The operator's future plans call for the installation of a similar type of system for the city's traffic division and a communications link connecting the Longmont's school system's computer terminals with a computer mainframe. The system for the traffic department will control traffic lights via the operator's residential two-way cable and will involve the use of similar types of modems as those implemented in the SCADA system. Wilde expects the traffic control system to come to fruition within the year.

—*Constance Warren*

NewsSweep

■ Scientific-Atlanta reported $95.1 million in sales for the quarter ended Dec. 31, 1982. This figure represents a 30 percent increase in sales over the second quarter of the 1982 fiscal year. Net earnings for the period were $3.5 million, or 15 cents per share, as compared to $280,000 or one cent per share for the same quarter in 1982.

■ In an effort to improve its service to cable customers, AM Cable TV Industries has formed three company divisions. The Field Services division will be responsible for cable systems construction; the E-Com Products division will be in charge of producing interactive and off-premises addressable systems; and E-Com Labs will continue to develop new concepts and systems for the cable marketplace. E-Com Labs will be headed by Robert Dickinson, a senior vice president of AM Cable.

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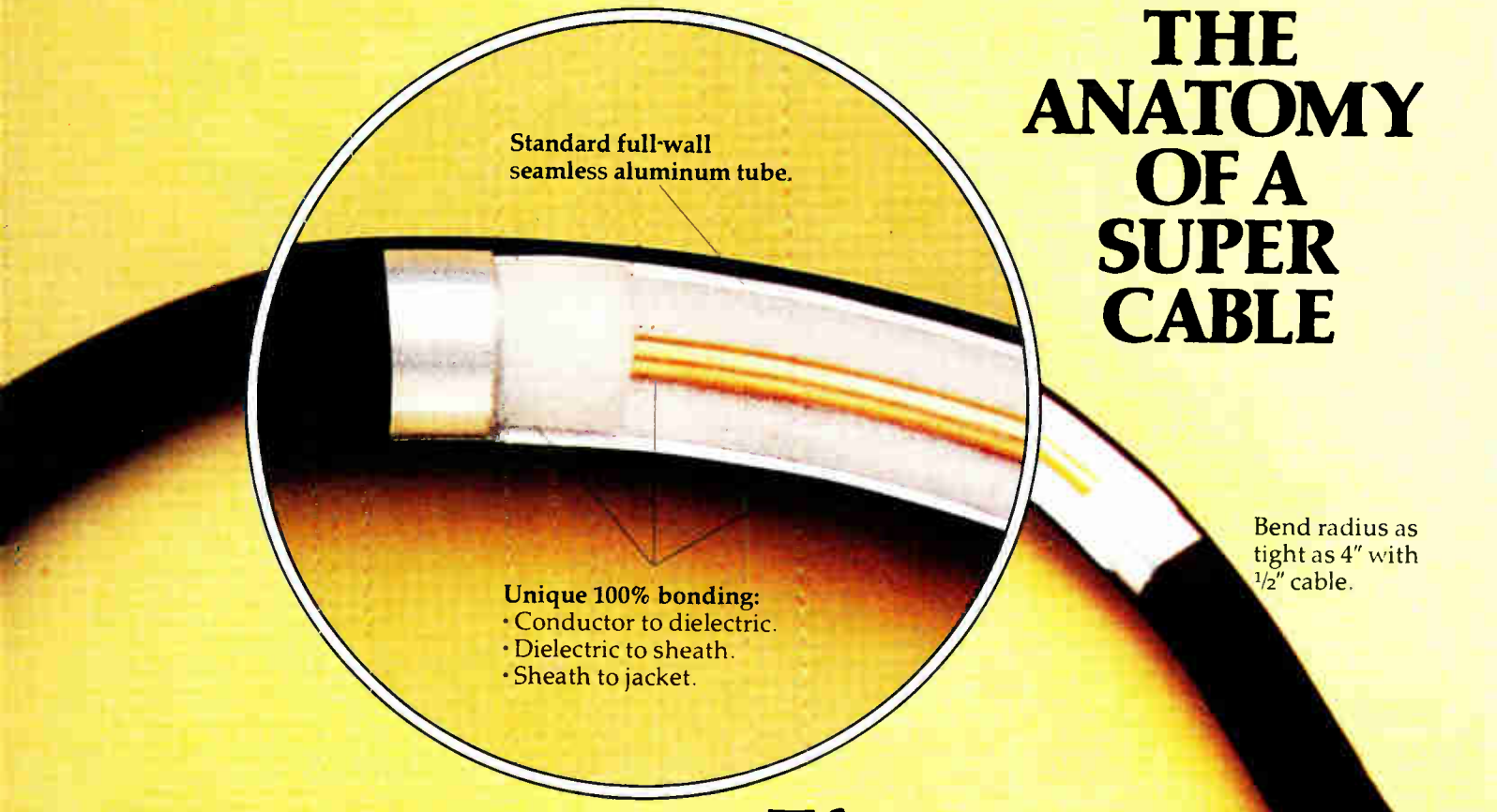

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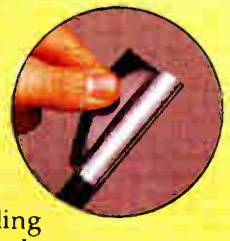

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TIMES FIBER COMMUNICATIONS, INC.
CABLE TELEVISION DIVISION

S-A courts SMATV market

S-A has introduced a new line of equipment targeted for non-cable industries

ATLANTA—Convinced that the mini-cable market is substantial as well as lucrative, Scientific-Atlanta has put together a complete package of commercial quality, low-cost products aimed specifically at non-franchised cable operators.

The equipment is designed for lodging, multiple-dwelling, institutional and private network applications. Two of the products have just been released, while three others are already part of the S-A line.

The new Model 9530 satellite receiver works in tandem with the S-A Model 362 low noise converter and comes in either a rack or table-top version. The 9530 can select, fine-tune and scan as many as 24 satellite channels, and features tuneable audio and volatile as well as non-volatile memory for set-up instructions. Single and dual LNC selection also are standard.

"The Model 9530 provides the same quality as the Model 650 receiver, but has a lower cost because it is less modular," according to Steven Havey, earth station product planning manager. Some flexibility has been traded for lower cost and simplified design, he says.

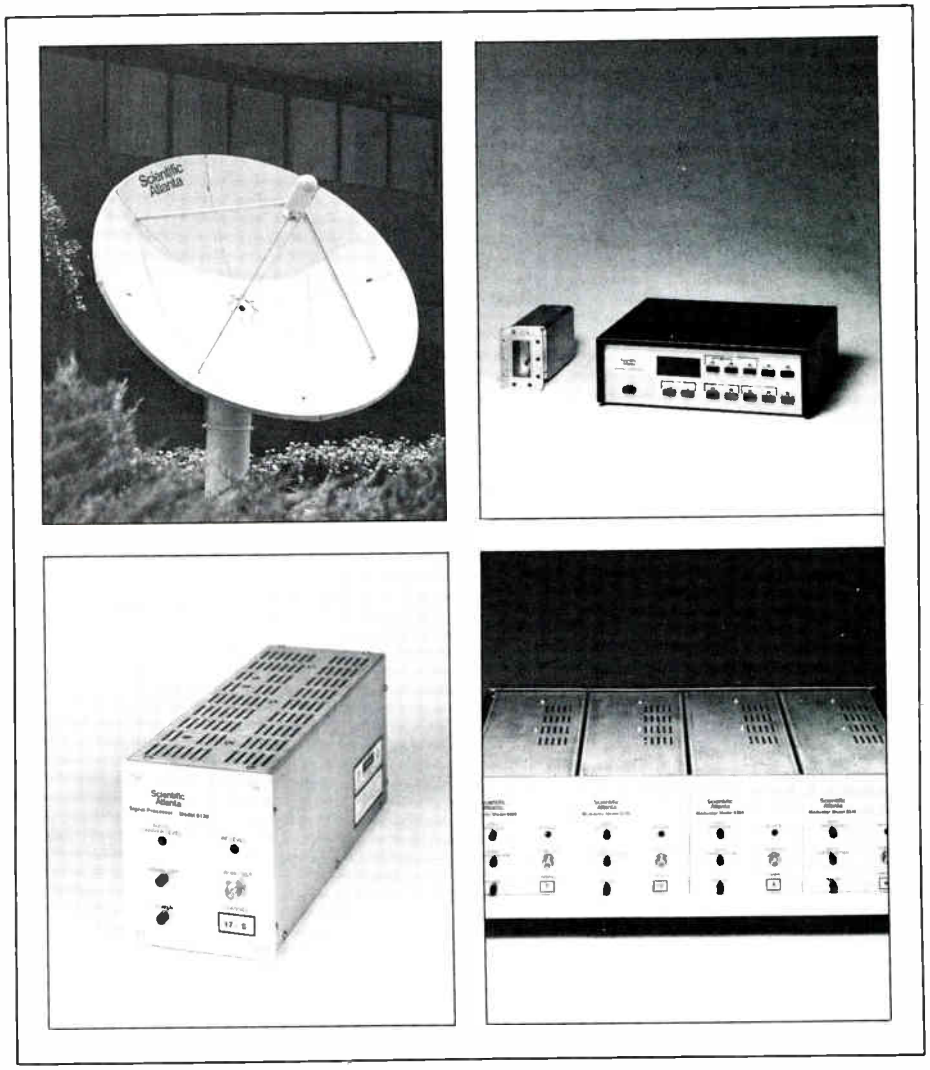
The other new product is a Series 9000 motorized polar mount for 2.8- and 3.2-meter earth station antennas. The new mount allows viewing of any satellite in the visible equatorial arc. Once positioned, no additional manual adjustment is required.

The mount features a microcomputer controller that stores satellite locations in memory. It can find the position of any existing satellite in geosynchronous orbit and also can predict and find the future locations of new geostationary satellites.

"End users of satellite receiving equipment are increasingly less sophisticated—for example, apartment managers rather than cable companies—and this new product makes life easy for them," says Havey.

The antenna is repositioned automatically by the use of a keypad, and is remarkably easy to put together, according to Havey. "A two-hour setup time for the entire Series 9000 station is not unusual."

Additional features include selection of dual linear or ferrite polarizations and reflector panel edge polarization adjustment, the company reports. A Ku-band feed, de-icer and surface foundation assembly are also available.



Clockwise from top left are Scientific-Atlanta's 2.8-meter antenna, 9500 satellite receiver, 6330 video modulator, and 6130 signal processor.

Other products in the system are the Model 6130 signal processor, 2.8- and 3.2-meter antennas and Model 6330 video modulator. All are compact and low in cost.

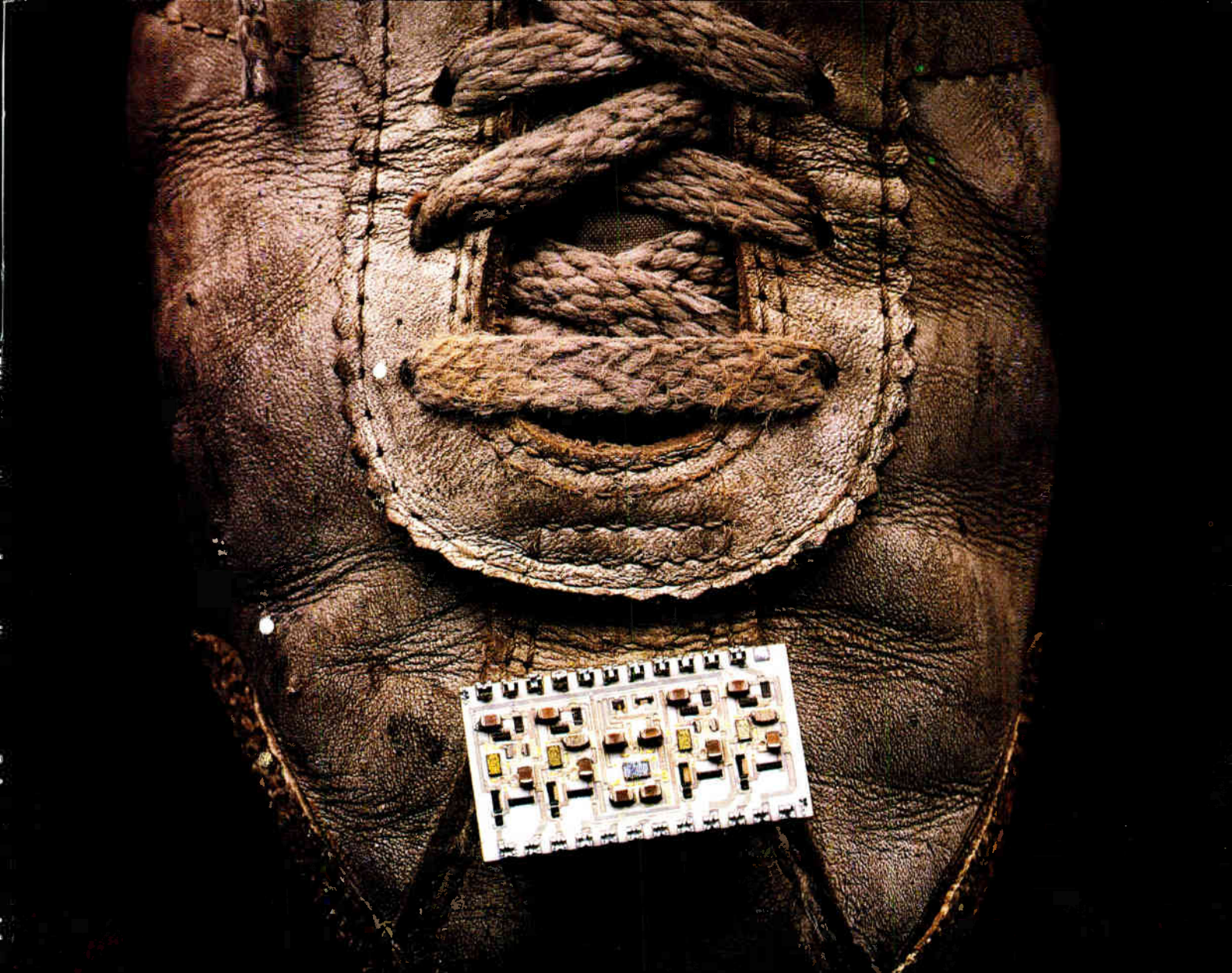
"A single-channel system cost $100,000 seven years ago," Havey says. "Now you can buy a 3.2-meter system plus receiver for under $5,000."

Four 6130 processors can be mounted in a single 19-inch rack. Like the new receiver, the processor boasts lower cost, achieved by the sacrifice of some flexibility and modularity. However, signal output quality is virtually identical, the company says.

"The Model 6150 processor can handle video switching, phase locking and hyperband channels. The 6130 can't, but the typical mini-cable operator wouldn't need those functions," Havey says.

The 6130 does include surface acoustical wave filters, automatic gain control, adjustable sound carrier level, high-level IF switch and adjacent channel rejection.

It supports VHF, midband and superband output channels, as well as VHF, midband, superband and UHF input channels. —*Gary Kim*



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Reader Service Number 15

DBS activity flourishing

Interest in DBS escalates as players expand service offerings

DENVER—The geosynchronous satellite is a perfect metaphor for the burgeoning DBS industry. Apparently stationary, it is constantly in motion. A flurry of recent earthbound activity provides ample illustration.

United Satellite Communications Inc., for example, has extended its five-channel service to Baltimore; Washington, D.C.; Cincinnati; and Richmond and Harrisonburg, Va. The company plans additional launches later this year, primarily in uncabled cities in the Northeast and Midwest states. Boston, Detroit and Philadelphia are on the list.

USCI also has signed movie rights agreements with Warner Bros. and Columbia Pictures, giving the firm access to films produced by all the major studios.

Satellite Television Corp., which plans a fourth-quarter 1984 launch of its five-channel service, "talks almost daily with a Fortune 500 company," said STC Senior Vice President for Marketing Ron Castell.

The company initially will beam signals to an oval area extending from Burlington, Vt., south to Norfolk, Va., and west to Pittsburgh.

In addition to the five video entertainment channels, STC "plans almost from day one to offer ancillary services of some kind," Castell said. The firm also has teamed with CBS to explore high definition television services in 1986.

STC expects to pick a maintenance company this month, and eight or nine vendors are in the running. When the firm is picked, it will be servicing earth station and receiver electronics made by ANCOM and Toshiba. ANCOM is a joint venture between Aluminum Corp. of America and Nippon Electric Corp.

Like USCI, STC plans to make movies the backbone of its programming. At least one superstation and possibly a sports channel will probably be a part of the eventual channel lineup, Castell said.

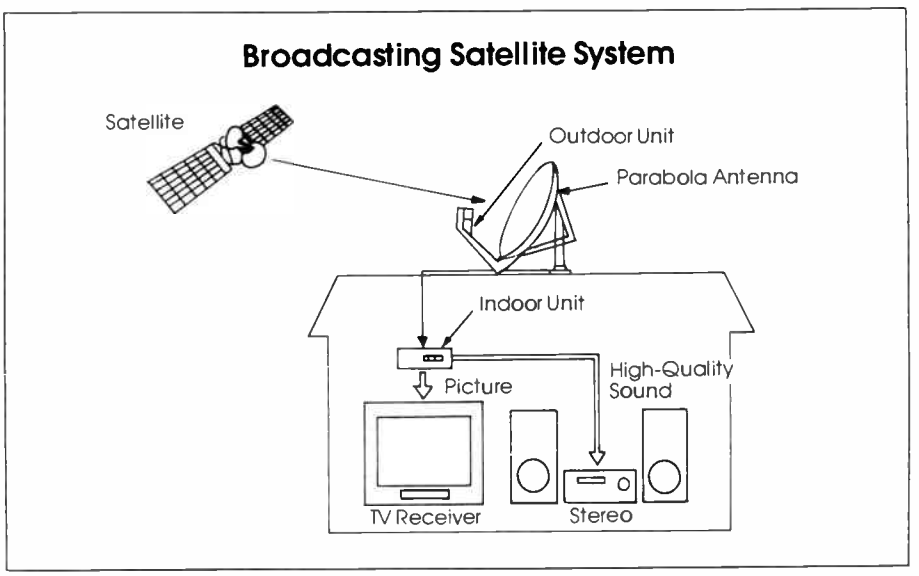
Meanwhile, both the Nashville Network and Turner Broadcasting continue to explore their own plans to distribute their programming via DBS.

Even some MSOs are considering hopping on the bandwagon. Daniels & Associates already has indicated that it will become a DBS player in its markets. GillCable, United Cable TV, Colony Communications and Cox Cable also are looking into the new satellite technology, according to recent reports.

Which isn't to say that things have been quiet on the business network side of the industry. Plans to develop the world's first downtown satellite communications teleport were recently announced in Washington, D.C.

The new complex will be constructed atop the National Press Building, and will offer video, voice and data communications services for government, corporate and news organizations.

Initial plans call for the installation of two five-meter Ku-band earth stations. —*Gary Kim*



Oak's DBS personal decoder

Canadian company orders 5,000 PD units for June delivery

CRYSTAL LAKE, Ill.—Oak Industries Inc. is writing contracts for September delivery of its new personal decoder for DBS applications. The first order for 5,000 of the "PD" units will be shipped to Canadian Satellite Communications Inc. in June.

A technological extension of the company's earlier generations of "C" and "I" decoders, the PD addressable converter is the world's first DBS unit aimed at the home market. The PD will sell for less than $300.

Developed at a cost of about $5.4 million, the converter is fully compatible with Oak's Orion scrambling system, and works with either C- or Ku-band transmissions.

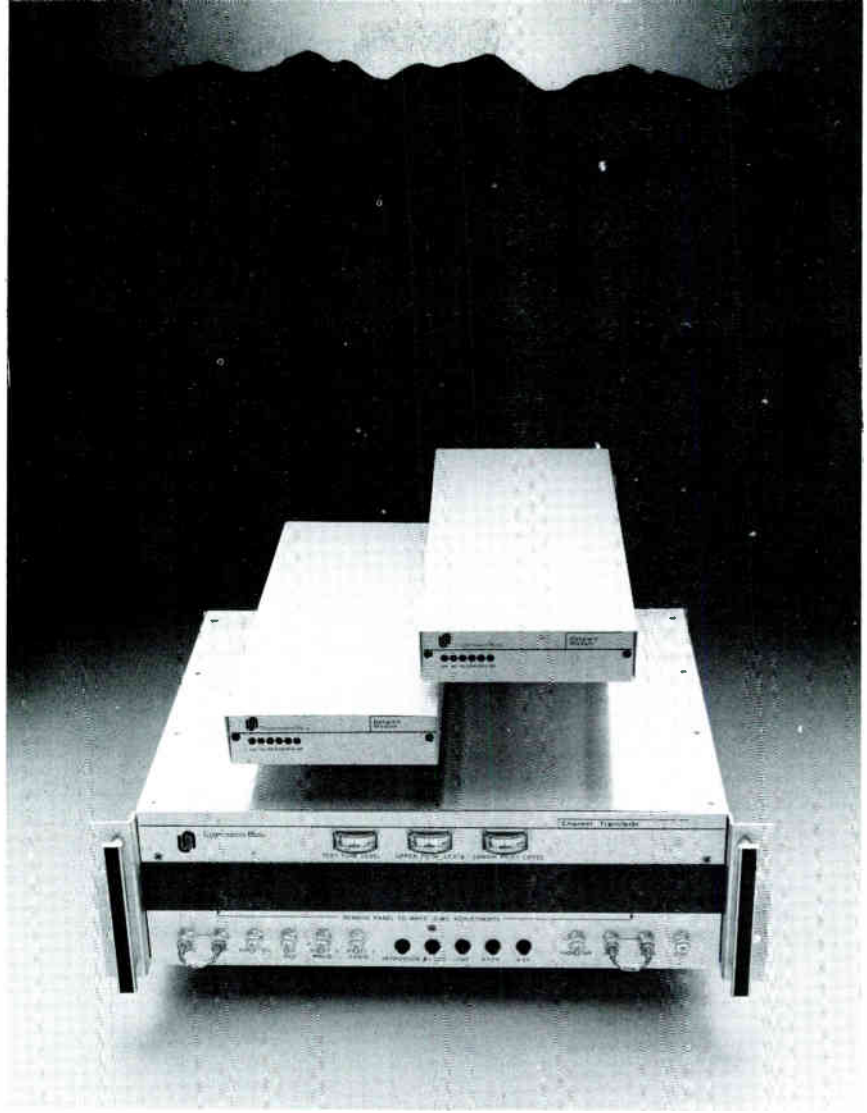
The stand-alone box is attached downstream from the receiver and produces RF-modulated output on channels three and four.

FCC's telco authorization opposed

FCC proposal met with disapproval in cable camp

Cable companies are skeptical of an FCC proposal to give telephone companies blanket authorization to build and operate cable systems outside their service areas. The FCC believes that striking the requirement that telcos file for commission approval to build systems "would serve to limit duplicative, unnecessary or inefficient facilities..."

The California Cable Television Association and the NCTA were concerned about the consequences of the proposed change. NCTA said that telcos could adopt a self-serving definition of "telephone service area," thus obtaining more regulatory relief.



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Training: Building a foundation

By Gary Kim

During the 16th century, the skies over Japan frequently blackened with arrows and resounded with the clash of armor against armor as armies contended for supremacy on the narrow eastern plains. The contending warlords built massive fortresses as protection from their rivals. All but one.

When asked why he hadn't built a stronghold, Takeda Shingen responded that "The people are the castle, the people are the walls, the people are the moat."

As modern-day battlefield commanders still will attest, technological wizardry counts for nothing if the troops are demoralized or untrained.

It's a point well worth remembering as the cable industry moves away from its massive franchise wars and settles in with the customer service focus that will provide the margin of victory in the battle for subscriber loyalties.

Privately, some industry managers and engineers worry about the troops. Bob Luff, vice president for engineering with United Artists Cablesystems Corp., worries openly.

"Training, or more accurately the usual lack of training, is a crime within the cable industry," Luff argues. "Losses caused by poor or non-existent system training are immense and rising."

The costs are hidden, but real, and waste both equipment and human resources. "When equipment isn't hooked up right and blows out, you have a couple of problems," Luff says. "The device has to be repaired or replaced. Somebody has to remove it. There's the cost of spare inventory and the cost to install the replacement item—and it all costs money."

Things weren't so critical during the industry's earlier, 12-channel days, Luff says. The smaller systems were more forgiving of error. But times have changed.

"Our systems are a lot more complex now," he says. "We're operating in the mid-band and have more problems with signal leakage; we've got adjacent satellites producing co-channel interference and we've got the FCC regulations to watch."

Pet peeve

If there is anybody in the industry who cares about training as much as Bob Luff, Ralph Haimowitz would be a good candidate. The Community Antenna Television Association's chief engineer is scathing as he talks about the woeful lack of technical skill within the industry.

> ***'Training, or more accurately the lack of training, is a crime within the cable industry. Losses caused by poor or non-existent system training are immense and rising.'***
>
> ***Bob Luff, United Artists Cablesystems Corp.***

"Management has no idea how little knowledge their technical people really have," he says. "Just because the technicians and engineers are maintaining the systems at a minimum level doesn't mean they know their jobs."

Pulling no punches, Haimowitz argues that the cable industry's technical people desperately need formal training. "Systems aren't working up to par because people don't have the basic knowledge of things like feedforward, much less understanding of data and two-way transmission."

Haimowitz, who conducts about 10 training seminars a year, says he "gets chief technicians, system engineers—both field and design—who don't know that they've been making improper signal level measurements for years."

On-the-job training is no guarantee of proficiency, Haimowitz emphasizes. "It's amazing how much erroneous information has been passed on by on-the-job training. There's a tremendous education and knowledge gap within the industry."

Complicating the problem is the fact that "in many cases, even the technicians and engineers themselves aren't aware of the gap," the chief engineer says.

And if something isn't done about it soon, cable's competitors—like DBS—are going to cause some financial damage. "The name of the game is providing the customer with the best picture we possibly can—and we're not doing that," Haimowitz argues. As the technology gets more advanced, "things are going to get worse," he says.

Bite the bullet

Despite the emphasis on some of the industry's other problems—like copyright and franchising—Haimowitz thinks signal leakage is still cable's biggest problem. Although a properly trained and motivated technical force can virtually eliminate the possibility of fines, Haimowitz reports that "98 percent of the technicians and engineers I talk to don't know how to translate raw leakage data and convert it to see if FCC specifications are being violated."

United Artists, Viacom, ATC and Group W are among the best MSOs in the country in terms of training, the CATA engineer believes. He also likes the seminars sponsored every year by Jerrold. But too few people are getting deeply enough into the technical aspects of headend maintenance, and not enough people take advantage of other manufacturer-provided training, he states. Haimowitz also likes the Hughes Microwave seminars.

He admits that formal training opportunities are a problem. "At this point there is no such thing as an electrical engineering degree with a specialty in cable television." But however difficult, "management has to bite the bullet on training."

New needs

Because the industry is maturing, specialties are beginning to develop.

Data communications and studio operations are two of them, Luff says. So in addition to training that helps systems avoid accidents, save money and avoid fines, United Artists Cablesystems is paying attention to training for the new specialized applications.

"Instead of training every technician at every system, or just one person at each system, we have created a new position of senior engineer," Luff says. "Usually a person with extensive industry experience and a college degree, this person becomes a consultant to all of our systems in a particular area."

If a new studio operation is to be started, UA's expert gets in on the early planning, setting the specifications and negotiating prices. As the construction phase begins, the senior engineer is on-site with the people who will operate the system. Other MSOs have found this practice efficient and cost-effective.

Unfortunately, all too many system operators, including independents as well as MSOs, don't think about training very much. "Many systems hire a new person, pair him or her with a senior person for a few days or a week, and that's about it," Luff says. "The downfall of this method is that both good and bad habits are taught."

"It's also pretty well documented that on-the-job training is most useful after a classroom or other more formal instruction method is used," the engineering chief says. "If the training is handled nonchalantly, as it all too often is, employees are going to treat the information that way too."

On the other end of the spectrum, American Television and Communications Corp. has set up its own National Training Center, and Luff considers it the best industry model available.

"They've got their own full-time instructors and know their company's policies and equipment," Luff says. "They can cycle their key personnel through, customize the training and emphasize the points that are most important for their people in the field."

Getting the job done right the first time does save money. But financial considerations aren't the only reason to emphasize training. Improper grounding, for example, can lead to accidents. Injury as well as loss of life, not to mention property damage, are some of the dangers posed by inadequate training.

In addition, there is always the threat of fines by the FCC, Occupational Safety and Health Administration as well as state agencies.

Importing fish

It is perhaps understandable that the industry has generally paid so little attention to personnel development. "We were so busy with franchising before that we just threw money at problems," Luff says. "We didn't have time to train people, so we just paid whatever it took to lure someone away from another company."

But the franchising wars have ended. There's less growth—and less money to spend. Operators are paying attention to the bottom line, and that presents opportunities as well as challenges. Now that managers aren't spending all day sitting in franchise meetings, they can devote some time to training needs.

The industry can no longer afford the wild salary chases that were an alternative to internal employee development. That's probably healthy.

"The water holes have dried up and it's tough when managers start importing fish," Luff says. "We have to draw on the pool of people we have." He expects that things will get better as average pay levels rise and cable technicians aren't at the bottom of the pay scale for technicians in the electronics industry.

Incentives needed

One of the reasons for training's low priority on managment checklists is that there are no incentives for superior performance in this area, Luff says.

There are no guaranteed results in the short term. Progress isn't swift, and the benefits of training often are not seen until months or years later. But, over the long term, operators who have emphasized training will find their employee morale higher and their turnover lower, Luff says.

"The benefits of training are hard to track or measure, but overall, result in a less costly and smoother operation," the UA engineer says.

Another problem, Luff reports, is that managers lack an appreciation for the effectiveness of classroom training. A scarcity of adquate textbooks is a further hindrance.

Correspondence courses, such as the National Cable Television Institute's offerings, "are an excellent bargain," Luff says. The only drawback to them is that the system management has to be supportive, according to Roland Hieb, NCTI's executive director. Luff agrees.

"Some managements abuse the courses," he says. "Employees need incentives—real and immediate—to stay with it. If other employees not taking the course are getting promoted without putting in the extra effort, why should they bother?"

NCTI, which has 4,000 active students, also makes its materials available to some community colleges and vocational schools with the hardware required for actual hands-on study. Otherwise, the non-profit firm restricts enrollment to students already employed in the industry.

Whether training is acquired in a college setting or by correspondence, both Luff and Hieb emphasize the importance of encouragement. "Employees need to know that you care," Luff says.

Climbing ladders

A form of training that doesn't appear to work too well is internal instruction by the in-house engineering staff. "The chief engineer is usually too busy, it's hard to keep the classes on a schedule and it seems the people you need are always out of town," Luff reports.

Aside from making money available for training and giving the training program strong support, Luff suggests that systems have a library. "Hughes, Scientific-Atlanta and Jerrold all have good textbooks. The National Cable Television Association and Society of Cable Television Engineers, as well as the FCC, put out useful publications."

B.J. Raynes, director of marketing for McCaw Cablevision's northern region, has another idea for system operators. McCaw recently put 11 installers and customer service representatives as well as nine managers through a pilot customer service training program.

The 16-hour program was developed by ATC and Xerox Corp. and focuses on communication skills. "Our CSRs and installers deal with the same types of problems, and the program helped them understand that," Raynes said. The managers took the course so they'd know what their people were learning. McCaw managers also will be expected to act as coaches for their customer-contact personnel, Raynes said.

Ted Lovett, manager of Chambers Cable in Edmonds, Wash., got his start in construction and advanced through the ranks to become general manager. Like so many other managers, he has found that few installers have cable-related experience. Chambers' solution is a formal training program including the NCTI courses. Advanced electronics training is required for advancement to the senior technical levels.

At McCaw, all installers, construction and technical personnel advance through a set of six grades, with competency as well as written tests required at each level before advancement. The results?

"We have a lot of long-term employees," Lovett reports. "There is very little employee turnover at any classification. People know what the career ladders are, and know what they have to do to climb those ladders. It's good for the employee and a real help to the management as well."

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COOPER INDUSTRIES

Reader Service Number 18

Overcoming construction problems:

Tips for a smooth build

By Frank Hogan

Time is money.

No one is more aware of the truth of that old adage than the cable industry, where construction delays frequently are costly. Sometimes the causes are unavoidable, such as inclement weather. Yet at other times, cable system operators may feel like kicking themselves for not taking alternative and more effective paths to solve delay problems.

CED wanted to learn what is causing construction slowdowns, and offer constructive steps to avoid these delays. Consequently, we went to the source—cable operators around the country—and asked about the biggest headaches they've encountered and how they solved the crises.

"Railroad right-of-way. That's our biggest problem," said Alan Kilgore, president of Grove Hill Telecable in Alabama. "It's easier to cross the interstate highway than the railroad."

Robin Brooks, manager of Cablevision of Soda Springs in Idaho, cited "easements and right-of-way" as his ever-present nemeses. "The original Army survey, when it (Soda Springs) was part of the Utah Territory in the 1880s, was 20 feet off,' he said. Now, the accuracy of more recent surveys is sometimes questioned by long-time residents. Brooks then is faced with citizens who refuse easement or simply don't understand right-of-way.

"Money and manpower" are Dick Windham's biggest obstacles. Windham, chief technician for Carson TV Cable in Nevada, said he has much copper-braided cable that needs replacing. Ideally, he'd maintain a two-man crew to install, troubleshoot and build on a daily basis.

Arthur Barnett, chief engineer for Tele-Cable Service Corp. in Borrego Springs, Calif., doesn't have a good enough working relatic ,nip with developers." He's had problems with underground cable being cut. "We put cable in when they're not at final grade and the developers keep grading and grading until the cable's exposed."

Improving railroad relations

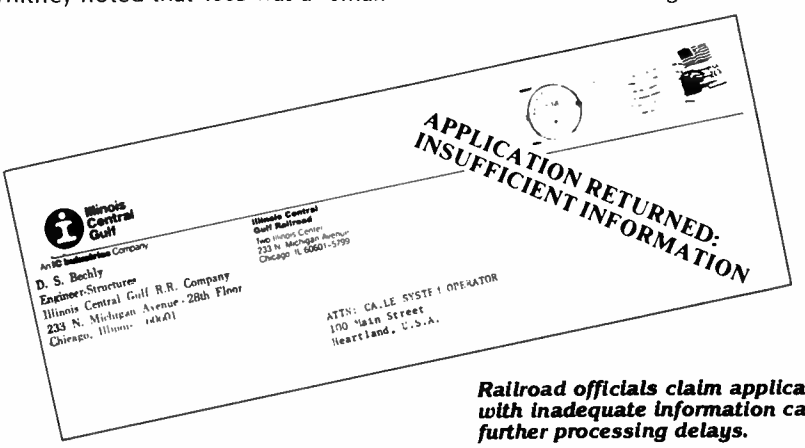
Wat Gray of Citronelle Cable in Alabama echoes Kilgore's sentiments regarding railroad relations. "The railroad operates like it did 100 years ago," he said. "It takes six weeks to two months to get permit approval." Asked whether there is a way to speed up this application process, Gray admitted the prospects looked bleak. "The local guy has no authority," he said. "Corporate headquarters are the only ones able to give approval."

Illinois Central Railroad officials agreed. Nick Whitney, bridge engineer for IC, advised cable companies to "find the person in the railroad who's in charge of pipeline crossings or overhead, and if there's a problem, call him." Whitney knows best. "I'm the guy at Illinois Central in charge of pipeline crossings," he said. Operators having troubles with Illinois Central overhead right of way can call Dennis Gruca, buildings electrical mechanical engineer. As Whitney's counterpart, he processes all overhead applications. Illinois Central's main number is (312) 565-1600. Whitney's extension is 2477, and Gruca's is 2667.

Whitney noted that 1983 was a "small year, with only 146 applications, but we've received 40 applications already in 1984." Any tips for cutting down application waiting time? "We can only handle them one at a time. Cable companies are not a huge revenue source for us," he understated. "Speed of handling is our most serious ongoing problem." Whitney offered little hope for speedy processing, but revealed a kink in the normal one-by-one handling practice by divulging that favoritism exists. "If a big shipper, a coal company or a chemical company wants a pipeline under the tracts, it usually gets more attention."

But there are ways of facilitating the application process. Whitney and Gruca offered the following advice:

- Don't mail the application via express mail. Illinois Central won't even glance at an application for at least two weeks, so don't waste your money on express mail.
- Become familiar with the National Electrical Safety Code. Turn to the section on railroads and study, study, study.
- If you plan on multiple crossings of the railway, consider utilizing IC's Blanket Agreement, which was arranged specifically for the power companies but may benefit cable companies in certain instances.
- Take care in filling out forms such



Railroad officials claim applications with inadequate information cause further processing delays.

as IC's Engineering Data Sheets. Read the instructions carefully, and if you have problems, call the proper railroad official before mailing the application. It could be weeks before improperly filled-out applications are discovered and sent back to the applicant for corrections, thus delaying the process even longer than the customary six-week waiting period.

■ Identify mile post markers before you submit your application. If you are unable to find the mile post markers (and often there may not be any), send a city map along with your application, and note what landmark the crossing is near. If the railroad officials are forced to identify the mile post marker themselves, it will delay the application further.

John Giudice, construction manager for Longmont/Loveland Cable in Colorado, learned of Burlington Northern Railroad's Advance Authority Form and reduced his application-approval waiting period to three or four weeks. "It speeds up the process incredibly," he said.

The key to unlocking the railroad's complex and frustrating inner-workings lies in knowing who to talk to and what to ask for. For starters, call corporate headquarters. The National Railway Publications Co., (212) 563-7214, offers the *Pocket List of Railroad Officials* for $15 per single copy. Mark Esposito handles requests for the book, and the mailing address is 424 W. 33rd, New York, N.Y. 10001.

Talking with telcos

Many cable companies have experienced problems with telephone companies at one time or another. Because of the high volume of activity in the Denver area, Mountain Bell has a "dedicated group for CATV, which was formed in 1982 to provide one point of contact for cable companies," according to Mike Markham, manager, Distribution Services. Markham offers the following tips to cable companies dealing with Mountain Bell specifically, and to telcos in general:

■ Don't make any assumptions about previous locations—each state has its own rules that must be followed.

■ A *Manual of Construction Procedures* is available upon request from Mountain Bell free of charge—a detailed guidebook on construction methods for parties "authorized to place their communications facilities on or in supporting structures... owned or administered by Bell Operating Companies."

■ Pre-planning is imperative. Check with regulatory bodies, and find out

what tariffs are on file, etc.

- Read contracts closely.
- Follow the steps in the general licensing agreement explicitly.

When faced with less weighty problems than dealing with telcos or railroads, try the common-sense approach. Brooks overcomes his out-of-whack survey problems in Idaho in a practical way—talking to people. He takes a city map along and uses a technique of friendly persuasion.

Tom Cotton, manager of the Meeker, Colo., system, experienced "no problems" with his recent Meeker/Rangely build and attributed his good fortune to "establishing good relations with the phone and power companies." It's a matter of "give-and-take. We're always talking." Cotton's theory is "you can't win if you fight." As a result, he's "never had trouble with the utilities." Communications is his byword.

Cotton applies his positive approach when interfacing with contractors, too. He plans ahead, continually supervises daily progress of the crews, and "shows concern for the workers on bad days and praises them on good days."

Bill Patrick, operations manager for the Twin Falls, Idaho system, advocated "good customer relations" and "tagging doors 24 hours ahead of time." His recent build was one of the "smoothest jobs" he can remember. Placing "one person in authority" over construction crews is his suggestion for avoiding construction delays. His supervisor of construction maintained constant contact with the crew in the field via a walkie-talkie. He also stressed the importance of choosing a good subcontractor. "Check references," he advised. "Call on two or three. Get a feel for what a subcontractor will do when faced with a problem." Patrick experienced no problems with his 28-mile build, and brought the project in at a cost of $8,500 per mile.

As for Barnett of Borrego Springs, Calif., he "hasn't found a way to solve" the problem of developers exposing and cutting his cable. A combination of pre-planning and communication with the developer might be the solution. If you have another answer, contact CED magazine and we'll pass it along.

Rebuilds: Avoiding unexpected problems

By Constance Warren

As part of an effort to pinpoint factors that most frequently interfere with rebuild schedules and upset rebuild construction cost projections, *CED* recently undertook a telephone survey in which chief technicians from rural systems across the country were asked two questions: what were the biggest problems you faced during rebuilding; and what measures did you implement to overcome these obstacles?

Lack of adequate preparation and difficulties with receiving equipment when desired were cited as the two factors most likely to play havoc with rebuild schedules and to result in additional, unanticipated expenses. Sometimes, these two factors were interrelated, as in the case of operators who did not account for supply and delivery turn-around times when determining rebuild construction deadlines.

Preparation key

George Wakulik, chief technician for the Newchannels system in Canonsburg, Pa., said his system's rebuild in 1982 was beset by a host of unexpected problems that could have been averted by a more thorough analysis of what the rebuild entailed before construction began. First of all, Wakulik explained, the contractor commissioned by the operator to rebuild the system subcontracted parts of the rebuild to "others who weren't too well-qualified to do the job." Secondly, in some cases, different equipment was required than initially anticipated. And thirdly, some additional construction procedures,

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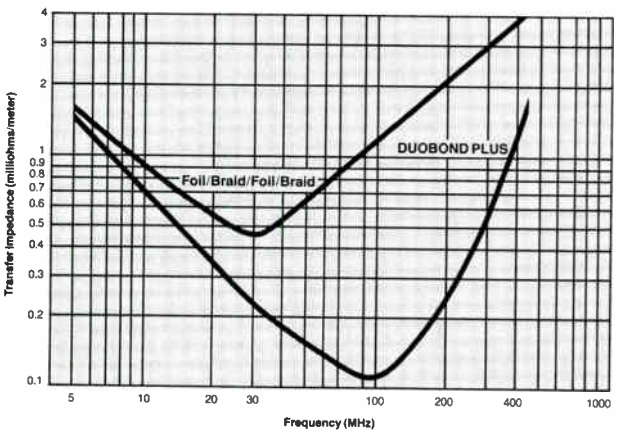
Belden's drop cable with DUOBOND PLUS™ shield helps you prevent costly call-backs. It's also the most shield-effective drop cable in the CATV industry.

Easier termination for maximum shielding integrity.

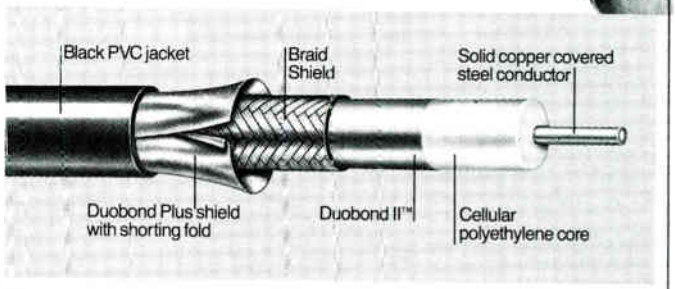
The DUOBOND PLUS shield features a foil/braid/foil construction with a shorting fold in the outermost foil which provides superior shielding effectiveness to typical 4-layer shield constructions. The transfer impedance graph demonstrates this effectiveness.

The added benefit is easier termination. This means less chance for error, resulting in greater shielding integrity and reliability. It also means fewer call-backs, lower operating expenses and more satisfied subscribers.

Cables with the DUOBOND PLUS shield require only half the steps for termination than 4-shield cables. Because it's less bulky, more flexible and its outer foil is bonded to the jacket, stripping and connectorizing are much simpler tasks. You can minimize your connector inventory to one size connector and one crimp tool.



Belden's unique shield protection.



The inner foil of the DUOBOND PLUS shield is bonded *directly* to the core. Foil pushback and signal leakage problems are eliminated. Protection from shielding degradation is eliminated during installation–where most shielding problems occur.

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Reader Service Number 21

COOPER INDUSTRIES **BELDEN**

such as reframing poles for deadends, had to be performed.

In retrospect, Wakulik said that he could have avoided many of these difficulties if he had spent more time preparing for the rebuild. He stressed the importance of "knowing what you have to start with" before beginning a rebuild. "You have to survey the existing system," he emphasized, and then "set the design criteria." Another measure he would implement before initiating a rebuild would be to "sit down with the contractors and the field foremen," and determine exactly what the rebuild would involve, what equipment would be needed, how the new system would tie into the old system, how long the rebuild would take to complete and how much it would cost. He also would take into account supply and delivery dates so that construction downtime, which results in "extra charges," could be eliminated.

Similarly, Ron Lindsley, chief technician for another Newchannels system in Oneonta, N.Y., said the difficulties his system experienced in rebuilding could be attributed directly to inadequate planning. According to Lindsley, "laying out the system" proved to be the most insurmountable obstruction to completing the rebuild, especially since the operator "hadn't taken into consideration the old system here." One effect of this oversight concerned taps into the home, which were not replaced during the rebuild. The result of these and other similar types of errors was that the operator was forced to "redesign the system after the new system was built." Obviously, in this instance, lack of preparation resulted in more than just inefficiency: it cost more money.

At least two other operators prioritized coordination and organization as the most crucial elements involved in meeting rebuild construction and cost projections. Robert Holcom, chief technician for Cablecom of Roswell, N.M., is "just beginning" a rebuild, which requires a total rebuild of an old government Air Force base and revamping the rest of the network. While Holcomb has not experienced slowdowns in rebuild construction yet, he "wants to get things organized" so the corporate construction group performing the rebuild "can do some of (the upgrade) when they do the Air Force" rebuild. He said that he keeps his "staff up to par in construction practices so we can do these kinds of things ourselves" if the equipment ordered arrives before the corporate construction group.

Jim Sims, chief technician for Twenty CATV Inc., an operator located in Carrollton, Ga., identified "outages" and the ensuing onslaught of "customer complaints" as the "worst parts" of the system rebuild. He said one unpleasant surprise that caught him off guard was "finding out that we had to replace more (hardware) than expected." Fortunately, he was able to acquire the needed hardware immediately from the TCI Southeast group house, which "had the stock on hand." He also tried to alleviate the effects of the outages by deploying his "entire staff" in early morning rebuild construction activities.

Glen Hollins, a technician for Court Cablevision, Washington Court, Ohio, offered another solution to the outage dilemma—building the new system alongside the existing system.

'Operators prioritized coordination and organization as the most crucial elements involved in meeting rebuild construction and cost projections.'

Dick Hall, plant manager for Group W Cable in South Daytona, Fla., and Jim Peterson of Warner Amex Cable of Myrtle Point and Coos Bay, Ore., both discovered flaws in their systems once their rebuilds were completed. When "it became a little cold," Hall recalled, the main trunk started "pulling apart," the result, he says, of a "bad splicing job." Meanwhile, Warner Amex Cable of Myrtle Point and Coos Bay found its taps corroding only one year after the system had been redesigned.

Hall said the bad splicing job could have been detected before the system was turned on if the operator had "gone in and checked the amps and made sure (the trunk) was spliced right." Similarly, Warner Amex Cable of Myrtle Point and Coos Bay could have obviated the corroding tap situation if it had taken the system's proximity to the water into greater consideration when determining what kind of hardware it needed to complete the rebuild.

Lagging deliveries

Another predominant cause for rebuild delays relates to supply and delivery turn-around schedules. As Terry Petzoldt, chief technician for Horizon Telecommunications of Hastings, Neb., maintained, one of the "biggest problems we had was getting the necessary cable." Robert Holcomb, Cablecom of Roswell, N.M., said that his system hopes to skirt supply lag times by using an updated version of the equipment already used in the Cablecom system. A side benefit to this approach, he added, is to minimize the amount of spare equipment that needs to be stored. But, Holcomb cautioned, "new items are hard to get from the manufacturers" and, if another manufacturer's equipment is available, he'll use that instead since "most of it's (the equipment) interchangeable."

Wakulik, of Newchannels Canonburg, Pa., also said that operators need to stay apprised of supply and delivery dates so "they (the manufacturers or suppliers) can supply what you need when you need it."

Suppliers can help

Joe Cordani, director of purchasing for Telewire Supply Corp., interpreted the operators' complaints with slow deliveries to apply exclusively to "electronic equipment." The "nuts and bolts are no problem," he said, but headends, amplifiers and earth stations can take a long time to receive from the manufacturer. He advises the operator "not to put all your eggs in one basket, to leave yourself an out and to be flexible to go another route."

The operator should know where he can substitute, Cordani continued, so that if one brand of equipment is out of supply he can replace it with another unit from a different manufacturer. "Better planning" and knowing how long it will take to receive electronics also help, he said.

Gordon Halverson, director of marketing and sales for Anixter Communications, reaffirmed Cordani's suggestions. He said "generally, and particularly with a rebuild, the operator should work with a distributor" since a distributor offers just as "good" a price and "better" service. He also said the manufacturer is not interested in being a distributor since it "already has invested a lot of money in parts" and in developing the equipment, and does not want to incur the additional expenses involved in maintaining an extensive inventory. The threat of obsolescence, interest rates and the recent consolidation in the industry are other factors he cited that dissuade manufacturers from keeping large supplies of equipment on hand.

TECH II

CED's feature supplement and Product Profile

April 1984

- **Fiberoptics vs. Coaxial: The advantages and drawbacks**
- **Product profile: trenchers and plows**

Parsons 1750 trencher

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The 350sx answers questions the others didn't bother to ask.

1 **Size and Maneuverability?** Because the compact 350sx can be driven through a standard 36-inch yard gate, it can get to more jobs. Its one piece frame, greater weight and wide-tire set-up offer increased stability over articulated machines. Standard four wheel drive and four wheel steering provide control and maneuverability for mobiling, plowing and restoration.

2 **Operator Comfort?** On a 350sx, the operator sits in a natural position facing forward, not off to the side. An adjustable seat, tilt steering wheel and easy to reach, easy to identify controls make the 350sx comfortable and easy to run.

3 **Blades?** The 350sx can install material to cover depths from 12 to 24-inches, depending on soil conditions. A choice of cable feed blades are available, including blades for CATV and fiber optic cable. Pull blades are available for plowing in plastic pipe and other material.

4 **Options?** 350sx options include a choice of 35-HP-class gasoline or diesel engines, a cable reel carrier, a front-mounted trenching attachment and a boring unit for utility bores under sidewalks and driveways. A standard hydraulic manifold allows the quick snap-on attachment of optional hydraulic tools like hammers and tampers.

5 **Variable Speed Vibrator?** The 350sx's unique variable-speed vibrator does more work because you can adjust its fracturing force to meet soil conditions. Its dry vibrator unit makes greater use of available horsepower than vibrators with weights that run in oil. And its maintenance-free unitrolly assembly gives greater weight transfer for more efficient plowing.

6 **Parts & Service?** The Ditch Witch dealer organization is the largest specialized parts and service organization of its kind in the world. Which means you get parts when you need them, with trained service specialists who are ready to serve you in the shop or in the field.

Ditch Witch designed the 350sx to be more productive by building in all the features you wanted in a compact lawn plow — the ones the others overlooked. And now it's priced lower than the competition, too. That's why when it comes to greater on-the-job performance, dependability and value, the 350sx is the compact lawn plow that has all the right answers.
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Reader Service Number 36

Fiberoptics vs. Coaxial

Fiberoptics offer some advantages but the technology does require retraining

By Gary Kim

Bringing a new technology onstream is a little like shooting skeet. It's one thing to know the targets will be in the air. The trick is knowing when and where.

As Times Fiber Communications Inc. found out with its Mini-Hub system, squeezing the trigger just a fraction too early still means a missed target. So the company has reloaded its guns and plans to shoot again.

The first generation of its Mini-Hub product was designed to meet the most demanding requirements specified by the newer franchises. The star-switched, fiberoptic distribution system was engineered with full function two-way capabilities in mind.

The ability to handle data, videotex and teletext, voting, home shopping, opinion polling and impulse pay-per-view were offered as standard features on Mini-Hub I.

The fully addressable system was created to meet the needs of companies building plants in the urban high-rise environment, and while the company says it sold fairly well overseas, domestic demand was extremely thin.

"Few, if any, systems in the United States really needed the advanced features Mini-Hub could offer," says Times Fiber's John Holobinko, product line manager for the Mini-Hub system.

Changes

So the company went back to the drawing boards and came up with Mini-Hub II, retaining the best features of the original system and modularizing it. The fiberoptic drops were replaced by coaxial cable, and the result is a system that offers one-way addressability at a cost of about $135 to $140 per subscriber when remote control features are included, Holobinko says.

Fiberoptic drops can be added later by replacing the coax drop and changing the driver module. "Because the system is modular, a single drop can be upgraded to fiber without the need for changing out the other subscriber drops," Holobinko says.

"If any operator wants two-way capability in part, but not all of a system, it can be done," he says. "Each system can be individually tailored to meet the special needs each (operator) has."

Mini-Hub II prototypes should be available in April, and quantity delivery is projected for the fourth quarter.

All of the active electronics are centrally located in Local Distribution Units, which sit at the end of feeders. As new subscribers are added, expansion modules are dropped into the LDUs. "The result is a reduction in feeder plant by as much as 50 percent and the virtual elimination of line extenders, taps and passives," Holobinko says.

Each LDU unit contains eight Remote Switching Units in a typical configuration, and each RSU is connected to a single Subscriber Interface Unit which sits on top of the TV set. Additional LDUs can be plugged in to increase the LDU cluster to 96 or more drops.

The LDUs can be mounted underground or aerially; indoors or out.

One of the advantages of the system's two-way configuration is the isolation of the subscriber drops from the reverse path. "The headend only talks to the LDUs—not the SIUs," Holobinko says. That little feature eliminates the biggest single source of ingress.

Replacement of the fiberoptic drops means that installers and technicians can work with a technology they're familiar with. "Fiberoptic technology does require retraining," Holobinko says.

Weighing fiber

Given the state of the art of fiberoptic technology, its cost, the requirement for construction techniques new to the cable industry and technician inexperience, Times Fiber's choice of coax might be wise.

"Aside from the fact that a more highly skilled staff is needed to work with it, I'm not sure what advantage is gained by using fiber instead of coax in the Mini-Hub system," said Robert Schack, manager for private networks at Byers Communications Corp. "I don't see a technical reason for it."

Weighing the uses of coaxial cable and optical fiber, Schack sees advantages for fiberoptic technology as a long-haul medium, but certainly not as a short-haul medium. "Fiber is more costly, but there is a gain if heavy electrical interference is a problem," he says. And even in the long haul, comparing coax to fiber is "a little like comparing apples and oranges," Schack says. Both have advantages.

Ralph Haimowitz, chief engineer for the Community Antenna Television Association, agrees with Schack on the merits of fiber. "Fiber's advantage is that it allows extremely long trunk cascades with less loss than coaxial cable."

Presently used as a replacement for supertrunk coax, Haimowitz sees future applications for fiberoptics as the vehicle for regional or national interconnects. In the near term, he isn't so sure. "There still are problems with fiber as a subscriber drop. Someday, new passives will probably let us use fiberoptics for the drops, but right now we haven't got it debugged."

Like a trapshooter with a back-up rifleman, Times Fiber is taking no chances on when the clay pigeons will be in the air. Mini-Hub II can handle both coax and fiber.

Handle with care

As the new carrier comes into wider use, cable technicians will have to brush up on some new techniques. Splicing, for example, "is a real bear," Haimowitz says. Special tools, a heat source and a microscope are required.

"And just to make things interesting, repairs on the fiber will—according to Murphy's Law—have to be made in the middle of the world's worst snow or ice storm," he says. Haimowitz is joking, but he makes his point.

Working with optical fiber isn't the easiest thing in the world. Consider the problem of attenuation for example. Under ideal conditions, fiber beats coax pretty solidly—top grades of fiber lose only about 1 dB per kilometer. Furthermore, attenuation in fiber is independent of the modulation frequency used—coaxial attenuates more at higher frequencies. But cable technicians working with fiber will need to learn a few new things about the causes of attenuation in the new medium.

Fiber attenuation results from two sources: absorption and scattering. Absorption is the product of impurities in the glass itself. The impurities absorb light energy and produce heat. If sea water was as pure as fiberoptic glass, one could see from the surface to the bottom of the deepest trough of the Pacific Ocean—a distance of more than 100 kilometers.

Scattering, the other major source of attenuation, results from imperfections in the fiber. Unintentional variations in fiber density and geometry can occur during the manufacturing process as well as during installation. Any variations of core diameter, microbends, as well as imperfections in the core-to-cladding interface, will cause signal loss.

Product Profile

Trenchers

Model	Trench depth	Trench width	Centerline trench to outside edge	Physical dimensions	Trenching speed
American Trencher 600 C	4 ft. 10 inches; @ 90 angle: up to 9 ft. 4 inches	6—18 inches in 2-inch increments	(of machine) left: 3 ft., 1.5 inches; right: 3 ft., 1.5 inches	(transport) 16 ft. 6 inches (l) x 7 ft. (w) x 10 ft. (h)	N/A
Ditch Witch 1420	60 inches max.	3¼—12 inches	18-9/16 inch; 16-11/16 inch (standard boom)	(transport) 82¼ inches (l) x 35½ inches (w) x 61½ inches (h)	(digging chain speed at 251 rpm: 305 fpm)
2200	64 inches	3¼—12 inches	28 inches, left, 29 inches, right	(transport) 149.5 inches (l) x 57 inches (w) x 66 inches (h)	(max. backfill speed) 2.9 mph
2300	63 inches	5—16 inches	28 inches, left; 29 inches, right	(transport) 149 inches (l) x 57 inches (w) x 82 inches (h)	(max. backfill speed) 4.1 mph
JI Case 25 + 4 XP	26—66 inches	4—12 inches	N/A	202 inches (l) x 54.3 inches (w) x 82.2 inches (h)	0—3.3 mph, forward or reverse
TF 300	66 inches max.	16 inches max. with special/assembly	N/A	85 inches (l) x 41 inches (w)	0—16 fpm
TL 100	24 inches	4—6 inches	N/A	99 inches (l) x 31.5 inches (w) x 39 inches (h)	1.80—4.82 fpm
Parsons T80	24 or 30 inches	4—6 inches	N/A	95 inches (l) x 32 inches (w) x 38 inches (h)	0—25 fpm
T120	24—36 inches in 6-inch increments	4—6 inches	N/A	115 inches (l) x 32 inches (w) x 38 inches (h)	0—25 fpm
Vermeer D-18	40—84 inches	8—18 inches	(tractor center) 30 inches; (to machine edge) 32 inches	75 inches (l) x 120 inches (h)	113—839 fpm
V-440 with V-12 trencher	30—60 inches	6—12 inches	(tractor center) 26 inches; (to machine edge) 18 inches	93 inches (l) x 71½ inches (w) x 91½ inches (h)	165—585 fpm

Plows

Model	Max. plowing depth	Transport speed	Operating speed	Engine	Dimensions	Weight
American Tractor Equipment OCLR-T	42 inches	N/A	N/A	N/A	N/A	3,700 lbs.
Burkeen DP-30 Vibratory Plow	28 inches (width: 3½—5 inches)	2.5 mph	0—100 fpm	Hatz Z790; two cylinder rated at 30 BHP —3000 RPM; fuel tank capacity: 5 gallons	99½ inches (l) x 35 inches (w) x 53 inches (h)	2,700 lbs.

Model	Max. plowing depth	Transport speed	Operating speed	Engine	Dimensions	Weight
Ditch Witch V252	16 inches	0—2.84 mph	N/A	Onan NHC-MS two cylinder; 25 horse power; 2.75 gallon fuel capacity	(transport) 85 inches (l) x 36 inches (w) x 42 inches (h)	1,370 lbs.
350 SX	27.5 inches	3.8 mph	N/A	Wisconsin W4 1770 four cylinder; 35 horse power; 6.6 gallon fuel capacity—or Deutz F2L511; two cylinder; 3.5 horse power	(transport) 152 inches (l) x 46 inches (w) x 84.5 inches (h)	3,270 lbs.
255SX	12 inches	215 ft./min.	83 ft./min. depending on soil conditions	Onan NHC, 25 horse power, gasoline engine, with 9 gallon fuel capacity	105 inches (l) x 32 inches (w) x 46 inches (h)	1,650 lbs.
JI Case Mini-Sneaker	18 inches	4.04 mph	0—200 fpm	two cylinder gas engine; 23 horse power	37 inches (w) x 77.5 inches (h)	2,055 lbs.
DH4	24 inches	7.17 mph	0—2.92 mph	four cylinder diesel engine; 50 horse power	63 inches (w) x 94.5 inches (h)	4,875 lbs.
475	36 inches	3.6 mph	1.18 mph (low range)	four cylinder diesel engine; 84 horse power	78 inches (w) x 112.5 inches (h)	15,480 lbs.
Line Ward Cable Line Layer	6—13 inches	68—140 fpm	56—98 fpm	16 horse power Kohler engine	50 inches (l) x 24½ inches (w) x 44 inches (h)	800 lbs.
Parsons DP-60 Saber Plow	0—30 inches	0—6 mph	0—1.3 mph	John Deere Diesel, 80 horse power, 2500 rpm	N/A	N/A
Parsons DP-180 Saber Plow	0—44 inches	0—11.4 mph	0—1.8 mph	Cat 3208 diesel, 175 horse power, 2500 rpm	N/A	N/A
Turfco Pipe Piper 100-A	5—12 inches	50 ft./min.	50 ft./min.	10 horse power four-cycle Briggs & Stratton	60 inches (l) x 34 inches (w) x 41 inches (h)	565 lbs.
Pipe Piper 180-B	5—12 inches	150 ft./min.	150 ft./min.	23 horse power two cylinder Kohler	78 inches (l) x 36 inches (w) x 54 inches (h)	1,275 lbs.
Vermeer V-1240	(cover) 18 inches	N/A	N/A	N/A	62 inches (l) x 83 inches (h)	975 lbs.
Rear P-2055 Plow	(cover) 30 inches	N/A	N/A	N/A	57 inches (l) x 90 inches (h)	1,820 lbs.

This month's product profile on trenches and plows provides an overview sampling of the products currently available on the market and a list of their respective specifications. Product profile is not intended to be a listing of all the equipment available in a specific hardware group. If you wish to be included in **CED**'s upcoming product profiles on test equipment, billing equipment and headends; modems and multiplexers; non-addressable and addressable converters; tamper proof, key locks and keypads/descramblers; character generators and ad inserter equipment; pedestals and safety equipment markers; and video cameras and recorders. please send pertinent specification sheets to Connie Warren, **CED**, P.O. Box 5727 T.A., Denver, CO 80217.

Macrobends also cause loss, and the degree of loss increases with the angle of the bend.

Fiber strength is affected by chemical or physical defects, which can occur during manufacturing, from atmospheric exposure, rough handling or stress corrosion. The surface condition of the cladding is important. Abrasion during handling can affect the fiber mechanically as well as optically. So buffer coatings, usually a polymer, are often applied during manufacturing. Cabling also reduces strain on the fiber.

A new frontier

Fiberoptics is a new frontier for most technicians and engineers in the business. But it isn't a recent discovery. As early as 1854, British natural philosopher John Tyndall had theorized that light in a dense medium couldn't escape to a less dense medium if the grazing angles of the light rays were sufficiently low. In 1870, he made a presentation to the English Royal Society, which proved that light could be guided within a jet of water.

The experiment illustrated the principle of total internal reflection: rays of light were carried through the water by reflecting from its boundaries. And this basic principle remains the foundation for the science of fiberoptics.

When light passes from one medium to another, it changes speed, which causes a deflection called refraction. Every material has a specific index of refraction: the ratio between the speed of light in a vacuum and its velocity in the specific medium. The amount of refraction depends on the refractive index. The angles of refraction are determined by comparison to an imaginary normal line drawn perpendicular to the interface of the two materials.

The angle of incidence is the angle of the striking ray, referenced against normal. The angle of refraction is the angle of the reflected ray, again measured against normal.

When light passes from a material with a lower refractive index to a substance with a higher refractive index, the ray is refracted toward the normal. But when the index of the first material is higher than that of the second, the light is refracted away from the normal. As the angle of incidence increases, the angle of refraction approaches 90 degrees with normal. A 90 degree angle of incidence is known as the critical angle. If the angle is incidence increases beyond 90 degrees, the light is totally reflected back into the first material.

Fiber design

The design of an optical fiber follows from these principles. A basic fiber consists of two concentric layers of material, and the inner layer, or core, has a higher refractive index than the outer layer, known as the cladding. Light injected into the core strikes the core-to-cladding interface at an angle greater than critical and is reflected back into the core.

Fibers are made of glass or plastic. Glass is smaller in size and more efficient, while plastic is more rugged and economical in less demanding settings. Hybrid plastic-clad silica fibers lie in between glass and plastic in terms of both size and performance.

Fibers are generally classified by refractive index and mode. The two major types are step and graded. In a step-index fiber, the core's refractive index is uniform, and there is a distinct step between it and the cladding. In a graded-index fiber, the core's index isn't

Ladders and lifts

Acme Ladders Inc.
Box 26593
Houston, Texas 77207
(713) 991-2180

Adrian Steel Co.
906 James St.
Adrian, Mich. 49221
(517) 265-6194

Aero Lift Co.
4 Fairfield Crescent
Caldwell, N.J. 07006
(201) 575-7484

Al Asher & Sons
5301 Valley Blvd.
Los Angeles, Calif. 90032
(213) 225-2295

Altec Industries Inc.
P.O. Box 10264
Birmingham, Ala. 35202
(205) 969-3400

CAM Industries Inc.
215 Philadelphia St.
P.O. Box 227
Hanover, Pa. 17331
(717) 637-5988

Cablevision Equipment Co.
3838 Caliver Dr.
Garland, Texas 75042
(214) 272-8551

Carbis Ladders
P.O. Box 4534
Florence, S.C. 29502
(803) 667-0848

Centel Supply Co.
770 N. Cotner Blvd.
Lincoln, Neb. 68505
(402) 467-5283

Commercial Satellite Systems
2955 Russel St.
Berkeley, Calif. 94705
(415) 848-4331

Durnell Engineering Inc.
Hwy. 4 S.
Emmetsburg, Iowa 50536
(712) 852-2611

EM Electronics Inc.
7523 W. Chester Pike
Upper Darby, Pa. 19082
(215) 352-4155

Easley Equipment Co. Inc.
2807 Farrisview Blvd.
Memphis, Tenn. 38118
(901) 362-7721

Evergreen Equipment Inc.
13588 S.E. 152nd
Clackamas, Ore. 97015
(503) 658-2121

Graybar Electric Co. Inc.
34 N. Meramec
Clayton, Mo. 63177
(314) 727-3900

KES (Klungness Electronic Supply Inc.)
107 Kent St.
Iron Mountain, Mich 49801
(800) 682-7140

Kerr Leasing and Fleet Services Corp.
P.O. Box 27419
Denver, Co. 80227
(303) 988-1198

Kindwall Corp.
P.O. Box 1557
Spencer, Iowa 51301
(712) 262-5810

Lift-Off Manufacturing Corp.
53 Pine St.
Deposit, N.Y. 13754
(614) 235-5000

Little Giant Industries Inc.
2241 S. Larson Pkwy.
Provo, Utah 81601
(801) 375-9620

McCabe Powers Body Co.
8900 Frost Ave.
Berkeley, Mo. 63134
(314) 524-8000

Midwest Corp.
One Sperti Dr.
Ft. Mitchell, Ky. 41017
(800) 543-7315

Mobile Lifts Inc.
1951 W. Main St.
Norristown, Pa. 19403
(215) 539-3700

Multiplier Industries Corp.
464 S. 10th Ave.
P.O. Box 29
Mount Vernon, N.Y. 10550
(914) 699-0990

Ogden, Curt, Equipment Co. Inc.
500 S. Hwy. Dr.
Fenton, Mo. 63026
(800) 325-9990

Plastic Techniques Inc.
P.O. Box 197
New Boston, N.H. 03070
(603) 487-5555

Poleline Corp.
20 Antin Pl.
Bronx, N.Y. 10462
(212) 829-1070

Priester Supply Co. Inc.
701 107th St.
Arlington, Texas 76011
(817) 261-1111

S.A.L. Cable Communications Inc.
5 Hub Dr.
Melville, N.Y. 11747
(800) 241-0992

Spartan Tool Co. Inc.
1521 Alum Creek Dr.
Columbus, Ohio 43209
(614) 253-0942

Standard Truck & Equipment Co.
1155 Hill St. S.E.
Atlanta, GA. 30315
(800) 241-9357

Stelco Inc.
5500 Kansas Ave.
Kansas Cty, Kan. 66106
(913) 287-1500

Teco Inc.
9733 Indianapolis Rd.
Fort Wayne, Ind. 46809
(219) 747-1631

Time Manufacturing Co.
7601 Imperial Dr.
Waco, Texas 76710
(817) 776-0900

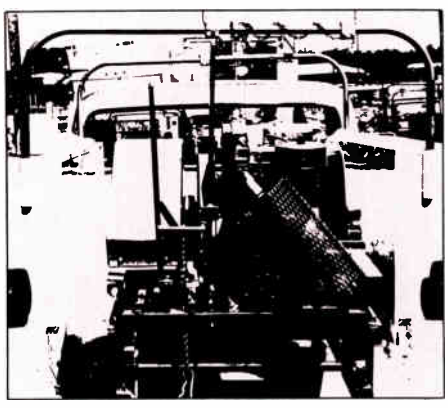
U-Tel CATV Products
2900 E. LaJolla Rd.
Anaheim, Calif 92806
(714) 630-7500

UEC Manufacturing Co.
121 N.E. 52nd St.
Oklahoma City, Okla. 73154
(405) 528-3446

Utility Body Co.
901 Gilman St.
Berkeley, Calif 94710
(415) 524-9333

Werner, R.D., Co. Inc.
P.O. Box 580
Greenville, Pa. 16125
(412) 588-8600

Wolf Coach Inc.
7 "B" St.
Auburn, Mass. 01501
(617) 791-1950



Specialized vehicles

Adrian Steel Co.
906 James St.
Adrian, Miss. 49221
(517) 265-6194

Aero Lift Co.
4 Fairfield Crescent
Caldwell, N.J. 07006
(201) 575-7484

Al Asher & Sons
5301 Valley Blvd.
Los Angeles, Calif 90032
(213) 225-2295

Alcestis Distribution Co.
P.O. Box 29
Grantville, Pa. 17028
(717) 469-0777

Altec Industries Inc.
P.O. Box 10264
Birmingham, Ala. 35202
(205) 969-3400

Commercial Satellite Systems
2955 Russel St.
Berkeley, Calif. 94705
(415) 848-4331

Devine's Machine and Design Inc.
P.O. Box 239
Grantville, Pa. 17028
(717) 469-0777

EM Electronics Inc.
7523 W. Chester Pike
Upper Darby, Pa. 19082
(215) 352-4155

Easley Equipment Co. Inc.
2807 Farrisview Blvd.
Memphis, Tenn. 38118
(901) 362-7721

Eastern Earth Boring and Equipment Co. Inc.
99 Parry St.
Luzerne, Pa. 18709
(717) 287-9621

Gem Top Manufacturing Inc.
8811 S.E. Herbert Ct.
Clackamas, Ore. 97015
(800) 547-9706

Jenel Consultants Corp.
9550 Forest Ln. #100
Dallas, Texas 75243
(214) 680-0502

Kerr Leasing and Fleet Services Corp.
P.O. Box 27419
Denver, Colo. 80227
(303) 988-1198

Masterack, Division of Leggett & Platt
905 Memorial Dr. S.E.
Atlanta, Ga. 30348
(404) 525-5501

Shook Electronic Enterprises Inc.
4846 Whirlwind
San Antonio, Texas 78217
(512) 653-6761

Stahl, A Scott Fetzer Co.
3201 Pine Cove
Wooster, Ohio 44691
(216) 264-7441

Standard Truck & Equipment Co.
1155 Hill St. S.E.
Atlanta, Ga. 30315
(800) 241-9357

Stelco Inc.
5500 Kansas Ave.
Kansas City, Kan. 66106
(913) 287-1500

Tele-Measurements Inc.
145 Main Ave.
Clifton, N.J. 07014
(201) 473-8822

Wolf Coach Inc.
7 "B" St.
Auburn, Mass. 01501
(617) 791-1950

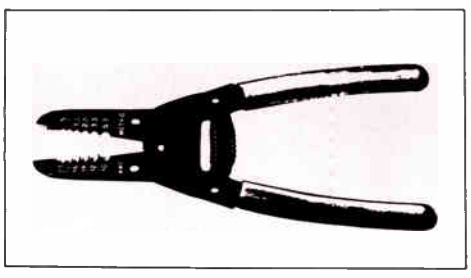
Cable Television Construction Expenditure

New plant construction In miles	1975	1976	1977	1978	1979	1980	
Underground	1,865	1,606	2,522	4,121	8,736	7,582	
Aerial	9,310	10,852	16,271	18,005	23,178	48,750	
Total	11,175	12,458	18,793	22,126	31,914	56,332	
Cost ($ in thousands)							
Antennas and towers	1,547	1,377	2,121	1,908	2,380	2,957	
Microwave equipment	6,460	5,826	5,323	5,901	18,553	18,060	
Headend	1,395	2,702	2,414	3,005	10,560	15,438	
Line amplifiers	9,556	11,175	20,134	23,942	33,612	87,692	1
Cable-Trunk[1]	21,653	6,936	10,877	12,027	21,584	54,478	
Feeder	—	8,651	8,332	10,168	51,598	65,456	
Drop	—	12,843	9,005	13,300	26,365	40,973	
Taps and outlets	16,796	25,594	13,597	13,274	30,587	28,340	
Converters-Nonaddressable	9,985	10,702	11,714	14,505	76,238	152,758	2
Addressable	—	—	—	—	—	—	
Construction services	15,240	8,340	10,888	15,158	110,568	197,847	2
Earth Stations[2]	12,525	49,064	15,004	19,273	13,621	9,050	
Pay TV security devices	—	—	10,193	19,369	13,664	43,140	
Local origination equipment	—	—	—	4,118	10,738	19,007	
Labor costs	—	—	—	—	87,241	204,193	2
Total	95,157	143,210	119,602	155,948	507,309	939,389	1,3
Replacement plant construction In miles							
Underground	655	207	1,222	1,159	1,508	1,145	
Aerial	2,600	2,893	6,236	6,998	6,635	8,925	
Total	3,255	3,100	7,458	8,157	8,143	10,070	
Cost ($ in thousands)							
Antennas and towers	885	536	544	527	711	592	
Microwave equipment	1,717	800	550	760	761	1,394	
Headend	1,056	1,401	1,678	1,552	588	760	
Line amplifiers	5,650	6,550	8,971	10,507	3,830	8,472	
Cable-Trunk[2]	5,585	2,709	4,507	4,378	2,483	4,159	
Feeder	—	3,091	3,451	4,151	4,511	9,796	
Drop	—	4,123	2,903	2,219	3,938	8,868	
Taps and outlets	958	1,118	5,537	5,870	857	1,879	
Converters-Nonaddressable	8,250	1,873	1,989	1,517	1,761	2,094	
Addressable	—	—	—	—	—	—	
Total	24,101	22,201	30,130	31,481	19,440	38,014	
Grand Total	**119,258**	**165,411**	**149,732**	**187,429**	**526,749**	**977,403**	**1,4**

[1]The figures indicated for trunk cable expenditure is the sum of expenditures for trunk, feeder and drop cable.
[2]The figure indicated for earth stations expenditures is the sum of expenditures for earth stations security devices, additional hardware and software.

CE

nstruction Equ



Now that the franchising wave of the last several years is slowing down, th providing quality service. A first step to achieve this is to construct the stressed from the ground up, including construction equipment. The com the systems run the spectrum from large to small, full service to specialize what it needs to keep its promise. Source: ICR, Cable Information Ser

Tools

AEG Power Tools
1 Winnenden Rd.
Norwich, Conn. 06310
(203) 886-0151

AVA Electronics Corp.
4000 Bridge St.
Drexel Hill, Pa. 19026
(215) 284-2500

Alcestis Distribution Co.
P.O. Box 29
Grantville, Pa. 17028
(717) 469-0777

Allied Steel & Tractor Products
5800 Harper Rd.
Solon, Ohio 44139
(216) 248-2600

American Overstock Exchange
P.O. Box 8332
Albuquerque, N.M. 87198
(505) 266-2198

American Technology
4902 Tollview Dr.
Rolling Meadows, Ill. 60008
(312) 398-6600

Arrow Fastener Co. Inc.
271 Mayhill St.
Saddle Park, N.J. 07662
(201) 843-6900

Bell Enterprises
2440 Parkway Pl.
Memphis, Tenn. 38112
(901) 327-1727

Benner Nawman
3070 Bay Vista Ct.
Venice, Calif. 94510
(707) 746-0500

Burnup & Sims Cable Communications Inc.
6440 Hillandale Dr.
Lithonia, Ga. 30058
(404) 482-7612

C & C Cable TV Enterprises Inc.
1707 Rte. 130 N.
Burlington, N.J. 08016
(609) 386-0777

CATV Services Inc.
3270 Seldon Ct., #5
Fremont, Calif. 94539
(800) 227-1200

CWY Electronics
405 N. Earl Ave.
Lafayette, Ind. 47904
(317) 448-1611

Cable Services Co. Inc.
2113 Marydale Ave.
Newberry, Pa. 17701
(800) 332-8545

Cable TV Supply Co.
5933 Bowcroft St.
Los Angeles, Calif. 90016
(800) 252-2098

Cablevision Equipment Co.
3838 Caliver Dr.
Garland, Texas 75042
(214) 272-8551

Cambridge Products
244 Woodland Ave.
Bloomfield, Conn. 06002
(800) 243-8814

Carbis Ladders
P.O. Box 4534
Florence, S.C. 29502
(803) 667-0848

Carlton International Manufacturing Corp.
1509 Central Park Dr.
Hurst, Texas 76053
(817) 284-5144

Carson Industries Inc.
1925 A St.
La Verne, Calif. 91750
(714) 596-1988

Cecon Inc.
P.O. Box 125
Berlin, Pa. 15530
(814) 445-8921

Centel Supply Co.
770 N. Cotner Blvd.
Lincoln, Neb. 68505
(402) 467-5283

Channel Master Division of Avnet
Rte. 209
Ellenville, N.Y. 12428
(914) 647-5000

Commercial Satellite Systems
2955 Russel St.
Berkeley, Calif. 94705
(415) 848-4331

Communications Supply Inc.
724 E. Union St.
West Chester, Pa. 19380
(800) 662-2428

Comprehensive Video Supply Corp.
148 Veterans Dr.
Northvale, N.J. 07647
(800) 526-0242

Conn, Jerry, Associates Inc.
130 Industrial Dr.
Chambersburg, Pa. 17201
(800) 233-7600

Devine's Machine and Design Inc.
P.O. Box 239
Grantville, Pa. 17028
(717) 469-0777

Ditch Witch
P.O. Box 66
Perry, Okla. 73077
(405) 336-4402

Diversified Manufacturing and Marketing Co.
1086 Gant Rd.
Graham, N.C. 27253
(919) 227-7012

Drop Shop Ltd. Inc. East
176 W. Westfield Ave.
Elizabeth, N.J. 07204
(800) 526-4100

EM Electronics Inc.
7523 W. Chester Pike
Upper Darby, Pa. 19082
(215) 352-4155

Elan Enterprises
502 E. St. Charles Rd.
Wheaton, Ill. 60187
(312) 690-8382

Electrotex
2300 Richmond Ave.
Houston, Texas 77098
(713) 526-3456

Elephant Industries
PO Box 3626
North Forth Myers Fla. 33903
(813) 995-7383

Fisher Research Laboratory Inc.
1005 I St.
Los Banos, Calif. 93635
(209) 826-3292

GC Electronics
400 S. Wyman St.
Rockford, Ill. 61101
(815) 968-9661

Gilbert Engineering Co. Inc.
P.O. Box 23189
Phoenix, Ariz. 85063
(602) 245-1050

Golden International
P.O. Box 5246
Golden, Colo. 80401
(303) 278-2514

Graybar Electric Co. Inc.
34 N. Meramec
Clayton, Mo. 63177
(314) 727-3900

Harrison, C., Associates
6290 McDonough Dr.
Norcross, Ga. 30093
(404) 449-7696

Hooper & Son Ltd.
1322 N. Academy
Colorado Springs, Colo. 80932
(303) 597-1914

Hughes, Ben, Communications Produ Co. Inc.
304 Boston Post Rd.
Old Saybrook, Conn. 06475
(203) 388-3559

ITW Linx
195 Algonquin Rd.
Des Plaines, Ill. 60016
(312) 296-5469

Ideal Industries
Becker Place
Sycamore, Ill. 60178
(815) 895-5181

Industrial Tool Distributors
544 Plaster Ave.
Atlanta, Ga. 30324
(404) 872-4780

Jackson Enterprises
4 Jacks Lane
Clayton, Ohio 45315
(513) 836-2641

KES (Klungness Electronic Supply Inc
107 Kent St.
Iron Mountain, Mich. 49801
(800) 682-7140

Klein Tools Inc.
7200 McCormick Rd.
Chicago, Il 60645
(312) 677-9500

LRC Electronics Inc.
P.O. Box 111
Horseheads, N.Y. 14845
(607) 739-3844

Larry Borson Co.
9461 Canfield Dr.
La Habra, Calif 90631
(213) 697-6852

Lemco Tool Corp.
Rte. #2, Box 330A
Cogan Station, Pa. 17728
(800) 233-8713

Line Ward Corp.
157 Seneca Creek Rd.
West Seneca, N.Y. 14224
(716) 675-7373

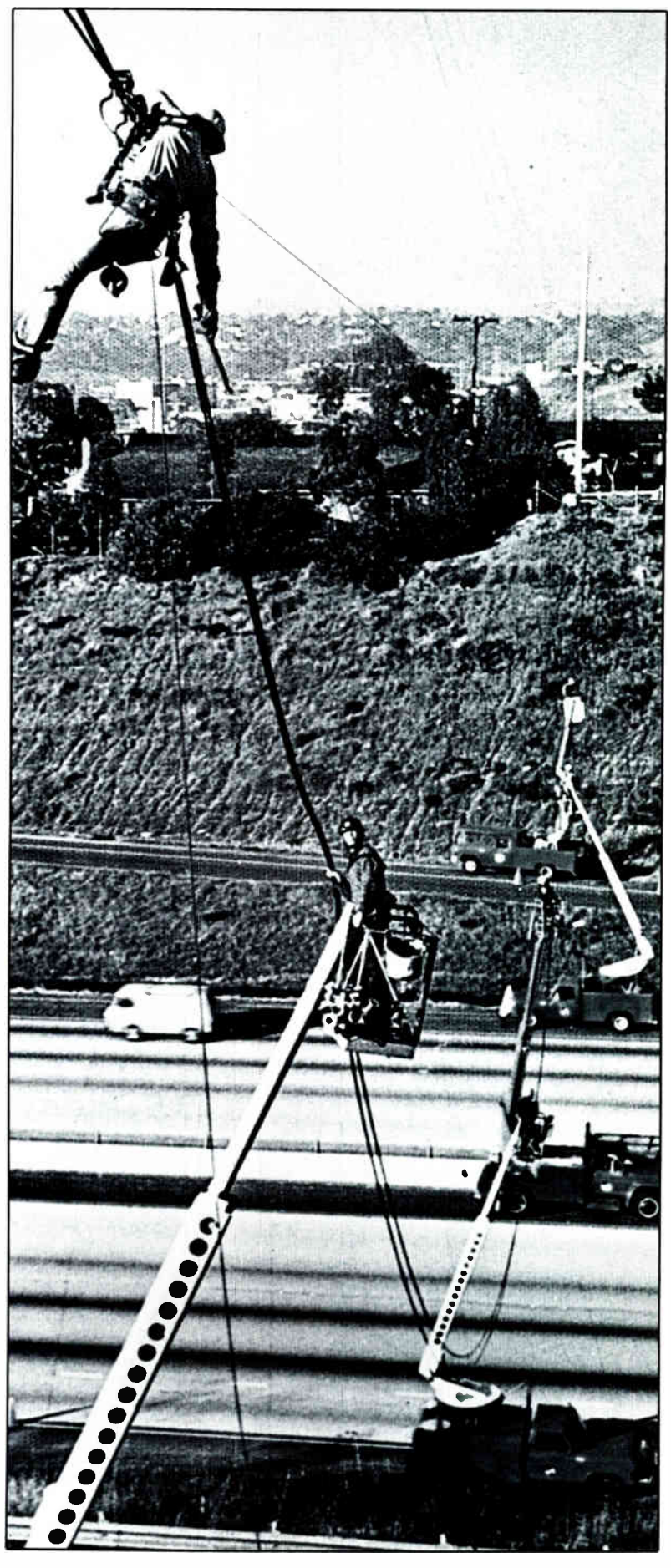
Little Giant Industries Inc.
2241 S. Larson Pkwy.
Provo, Utah 84601
(801) 375-9620

Macom Industries
8230 Haskell Ave.
Van Nuys, Calif 91406
(800) 421-6511

Marmax Sales, Division of World Prod Inc.
623 W. Vliet St.
Milwaukee, Wis. 53212
(414) 272-4048

s 1975-1984

1981	1982	1983 actual	1984 projected
14,110	10,437	7,015	11,435
57,505	73,331	61,960	68,468
71,615	83,768	68,975	79,903
3,750	4,926	3,900	4,200
25,000	32,874	25,300	27,100
28,611	34,355	25,800	28,600
03,256	133,136	117,500	136,300
31,810	98,521	79,400	93,700
97,448	114,948	98,700	114,500
59,419	74,129	62,000	72,000
39,611	49,266	39,000	44,800
43,760	184,076	131,500	143,300
53,440	158,625	172,000	215,000
50,276	311,984	248,500	262,900
13,750	16,428	14,000	16,800
53,694	65,683	49,700	54,700
24,164	32,859	24,800	27,300
70,154	328,451	287,400	323,300
8,143	1,640,261	1,379,500	1,564,500
7,247	4,202	4,125	5,668
6,705	28,220	23,025	26,432
33,952	32,422	27,150	32,100
1,391	3,268	2,900	3,200
3,276	5,252	4,600	4,900
1,585	3,385	3,100	3,400
3,167	22,177	20,500	23,600
1,538	14,006	12,800	15,000
23,400	26,845	24,600	29,400
21,250	23,344	21,400	23,000
4,278	4,669	4,300	5,900
5,100	8,431	9,900	12,000
750	5,573	4,500	8,000
95,735	116,950	108,600	128,400
83,878	**1,757,211**	**1,488,100**	**1,692,900**



D's

ipment Callbo

...e cable industry is facing the challenge of delivering on its promise and physical plant. With today's highly technical systems, quality must be ...panies that manufacture and/or supply the equipment necessary to build ...l, but all have one thing in common—providing the cable industry with ...vice—a Titsch Communications division.

...astercom
321 Wilkins Ave.
...ckville, Md. 20852
...01) 984-3697

...cLaughlin Manufacturing Co.
O. Box 303
...ainfield, Ill. 60544
...00) 435-9340

...ega Hertz Sales Inc.
...61 S. University
...ttleton, Colo. 80122
...03) 797-7900

...icrosat
...0 Brock Rd. S.
...ckering, Ontario L1W1Z8
...16) 839-5182

...idwest Corp.
...ne Sperti Dr.
... Mitchell, Ky. 41017
...00) 543-7315

PCS Video Industries Inc.
...4 W. 57th St.
...ew York, N.Y. 10019
...12) 586-3690

...ultiplier Industries Corp.
...4 S. 10th Ave.
...O. Box 29
...ount Vernon, N.Y. 10550
...14) 699-0990

...CS Industries
...55 E. Wyandotte Rd.
...illow Grove, Pa. 19090
...15) 657-4690

...elson Electric Supply Co.
...23 Slocum
...allas, Texas 75207
...14) 741-6341

...orth Supply Co.
...0 Industrial Airport
...ardner, Kan. 66031
...00) 255-6458

...orthern CATV Sales Inc.
...5 Twin Oaks Dr.
...racuse, N.Y. 13206
...00) 448-1655

...K Machine and Tool Corp.
...55 Conner St.
...onx, N.Y. 10475
...12) 994-6600

...ice Inc.
...93 Brewers Ct.
...urel, Md. 20708
...01) 490-9860

...nduit Corp.
...301 Ridgeland Ave.
...nley Park, Ill. 60477
...12) 532-1800

...deline Corp.
...Antin Pl.
...onx, N.Y. 10462
...12) 829-1070

...lycomm Corp. of America
...1 E. Erie St.
...icago, Ill. 60611
...12) 337-6000

...iester Supply Co. Inc.
...1 107th St.
...lington, Texas 76011
...17) 261-1111

...oduction Products Co. Associates
...3 W. Seneca St.
...anlius, N.Y. 13104
...00) 468-2288

...ogressive Electronics Inc.
...2 S. Extension Rd.
...esa, Ariz. 85202
...00) 528-8224

R.J.G. Enterprise Co. Inc.
116 Fayette St.
Manlius, N.Y. 13104
(800) 448-5176

RMS Electronics Inc.
50 Antin Pl.
Bronx, N.Y. 10462
(212) 892-1000

Reel-O-Matic Systems Inc.
P.O. Box 69
Wrightsville, Pa. 17368
(717) 252-3614

Riley Enterprises
3420 Treat Hwy.
Adrian, Mich. 49221
(517) 263-9115

Ripley Co. Inc.
46 Nooks Hill Rd.
Cromwell, Conn 06416
(203) 635-2200

S.A.L. Cable Communications Inc.
5 Hub Dr.
Melville, N.Y. 11747
(800) 241-0992

STV Supply Depot
7745 Alabama Ave., Unit 13
Canoga Park, Calif. 91304
(800) 252-7889

Satellite Video Services
Rte. 2
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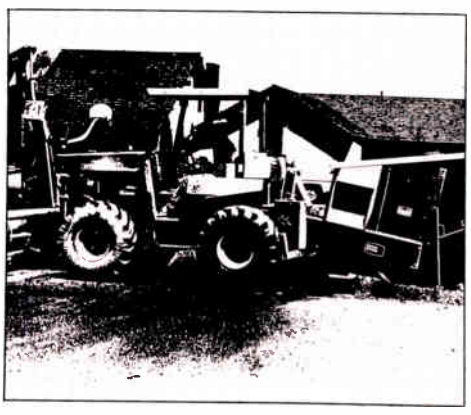

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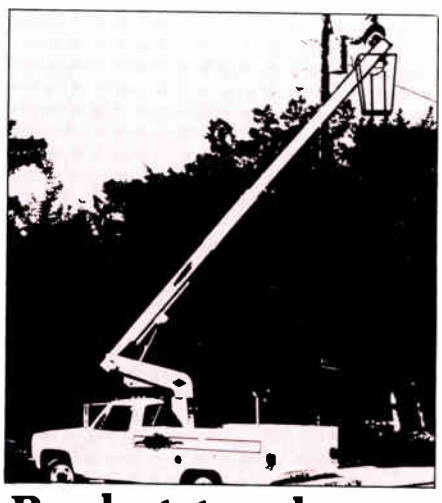

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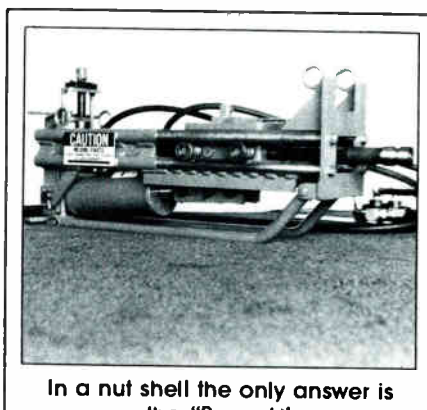

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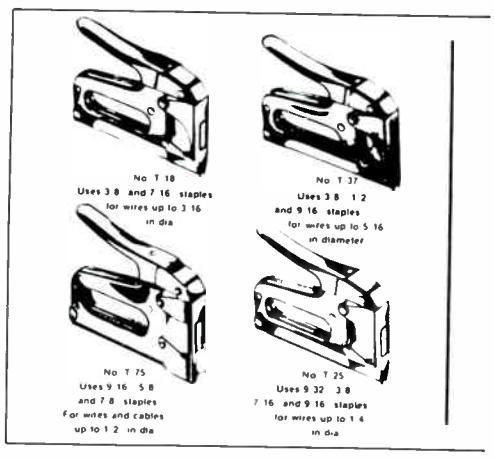

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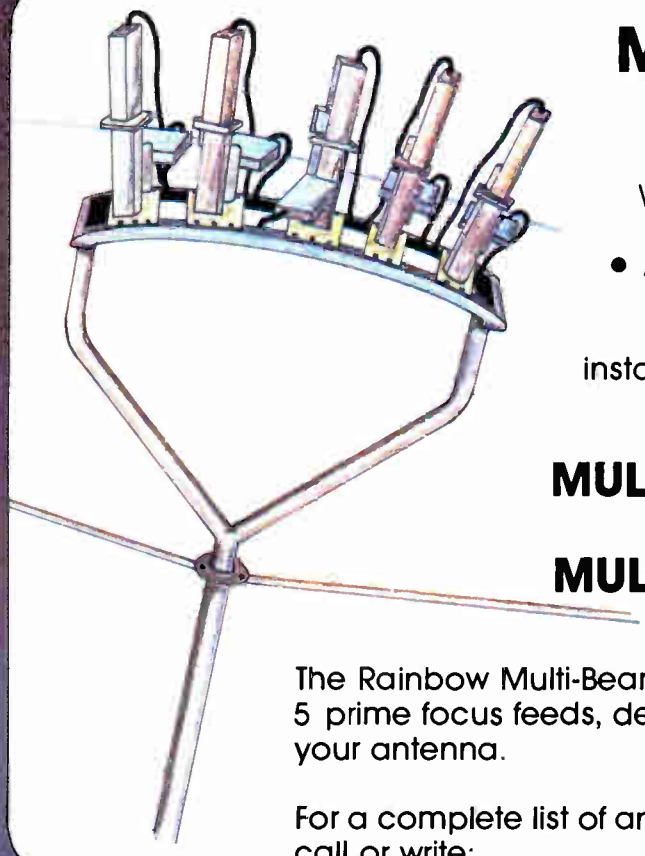

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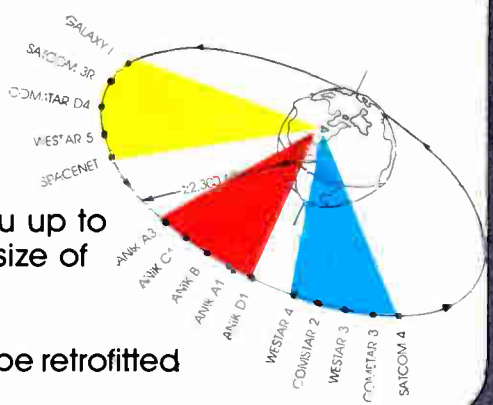

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uniform. Highest at the center, the index decreases until it matches that of the cladding at the material interface.

Three general categories of fiber exist. Multimode step index, the simplest type, allows many modes of propagation—the light rays can take many paths through the fiber. Consequently, some of the rays take shorter paths than others. The axial ray, which travels directly down the center of the fiber, arrives first. The others traverse longer paths, and so an initially narrow pulse of light spreads out as it travels through the fiber. The greater the distance, the greater the spread.

This spreading is called modal dispersion. Typical dispersion figures run from 15 to 40 nanoseconds per kilometer.

A single-mode step index avoids modal dispersion by using a fiber with a core diameter so small that only a single mode propagates. The single ray travels straight down the fiber without reflection. Suitable for very high-speed, long-distance applications, its small size makes it difficult to work with.

A multimode graded index fiber also tends to limit modal dispersion. It does so by varying refractive indexes within the fiber. Since light travels faster in a low-index medium, each consecutive concentric ring within the fiber has a lower index than the layer before it. The higher-order modes of refraction have a faster average velocity than the lower-order modes as a result—rays that bounce more spend more of their time traveling through low-index material.

The result is that all the modes tend to arrive at any given point at about the same time. Modal dispersion is typically well under 10 nanoseconds per kilometer, and can be as low as one nanosecond per kilometer or less. "A 20 megabit graded index fiber can carry a signal four miles without a repeater," Schack says.

The quality and performance of each of these types of fiber depends on the fabrication technique used to make them. As with most engineering decisions, a trade-off must be made—in this case between production cost and control over fiber composition and geometry. Commonly, a long cylinder of glass called a preform is made first. The fiber is then drawn from the preform.

An inexpensive technique is known as rod-in-tube. In it, an independently shaped rod is placed inside a tube, and both are heated until the tube collapses around the rod to make the preform. Although less expensive than other techniques, glass purity, control over refractive indices and irregularities in the core-to-cladding interface are problems. If a medium- or high-loss fiber is sufficient for a particular application, this method is satisfactory.

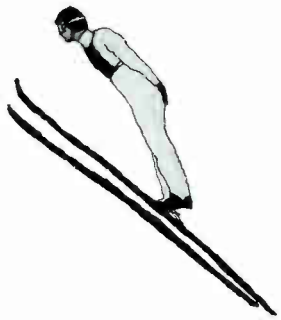
Double crucible is a second manufacturing technique. In it, molten core and cladding materials are held in separate and concentric crucibles and drawn through nozzles to make either a preform or an actual fiber.

Stratified melt is a related technique. In it, molten core material floats on top of molten cladding material. As in the double crucible method, both materials are drawn out to make a preform or fiber. Moderate-loss fibers are created by both processes.

Low-loss, high-bandwidth fibers are made by a process called modified chemical vapor deposition. A 3-foot tube of pure quartz is passed over a torch while chemical vapors are flowing through the tube. Tiny particles of glass are deposited on the inner surfaces of the tube, and after 60 to 70 layers are built up, the tube is collapsed around the glass.

There are variations on this process that build the glass core on the outside surfaces of a tube, or that build a preform by depositing raw materials on the end of a starter rod.

IN SOME PLACES, CONTROL IS EVERYTHING —



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CBS, IBM, Sears Videotex partnership redefines nature of industry

By Gary Arlen

CBS, IBM and Sears' plan to team up in a nationwide videotex service might be very good news for the videotex business but may have little or no impact on cable TV. Although CBS and Sears have substantial contact with the cable industry, cable doesn't figure into their initial plans for videotex service. The service will emphasize computer processing functions, as well as information retrieval and interactive banking, shopping, games and messaging. The system will use personal computers rather than dedicated videotex terminals for home reception and could include "true video" imaging as well as conventional videotex computer graphics. Although commercial service won't start until at least 1986, the partners intend to begin recruiting other equipment vendors, software firms, advertisers and information/service providers soon.

The joint venture is a boost for the videotex industry. The visibility of IBM and Sears lends new credibility to videotex, supplementing the longtime presence of CBS. The approach—use of many brands of personal computers and development of new graphics and services—also could change the definition of videotex by the time the service reaches the mass market in the late 1980s. The arrangement underscores IBM's recognition that videotex will be driven by services more than by technology. In addition, by developing a nationwide venture—rather than setting up a network system similar to the regional activities of Viewtron, Times Mirror and Keycom—the partnership sets the stage for intriguing local competition. The plan to use home computers, capitalizing on the burgeoning market for such devices, could torpedo the concept of dedicated videotex terminals now used in pioneer services. However, low-cost, single-purpose terminals may find an eventual niche among customers who use only small segments of the full videotex package of services.

Each partner has substantial videotex experience and brings specific facilities to the project. Sears' initial emphasis will be on financial services (brokerage, insurance and real estate) offered by its subsidiaries Dean Witter, Allstate and Coldwell Banker, but also will contribute sales, service and merchandising functions. CBS, in addition to its advertising and editorial expertise, will offer management, education and videogame programming from its software subsidiary. IBM will provide software and hardware facilities, and there is speculation that it will develop a low-cost receiver to supplement microcomputers now available. IBM's involvement includes the company's videotex group in Westchester County, N.Y., as well as its personal computer staff.

The companies won't divulge the budget for the project or the initial funds each is contributing. No name has been selected, nor have any decisions been made about location or facilities for the new company, which will be staffed by employees from CBS, IBM and Sears.

Many questions—but few easy answers—arise from the new partnership:

■ **Which technology?** Although each partner has worked with NAPLPS format, there is no commitment to using this standard. A CBS executive downplayed the importance of technical standards; an IBM spokesman told us that initially the service would offer ASCII format data—seemingly adequate for computer software teledelivery and for many home banking/financial services. Other observers have suggested that the partners may use a modified form of NAPLPS. CBS is believed to favor the Dynamically Redefined Character Set (DRCS) format used in the Ridgewood test. In any case, the partnership will devote considerable effort to identifying technical requirements—and by the time a service rolls out, the environment could change considerably. The possibility of using "true video" format—especially for merchandising applications—ties in with CBS' activity in high-definition

TV and IBM's various imaging efforts. Initially, any such video images would be "still pictures," which can be transmitted on narrow-band telephone lines. IBM also has demonstrated a variety of other computer graphics standards, raising the prospect that an entirely new display format could be introduced. Skeptics are concerned that such an approach might escalate the cost of the initial equipment, an issue which the partners say they cannot yet address.

■ **Was AT&T jilted?** AT&T, which worked with CBS in last year's Ridgewood, N.J., videotex trial, is not dismayed by the new triumvirate. The CBS-AT&T relationship was limited to the trial, and each had access to all the results. AT&T used the findings to build its current and future videotex terminals and frame creation devices. AT&T Consumer Products expects to deal with the partnership to determine if AT&T devices could be used as reception units. Technical experts who have dissected AT&T's Sceptre videotex terminal attest that it has the ingredients of a powerful home computer; Sceptre is apparently the forerunner of AT&T's long-awaited personal computer. It is certain to be on the market by the time the CBS-IBM-Sears deal comes to fruition.

■ **Will others embrace the partnership?** Sears' major role in financial services and merchandising poses a challenge and an opportunity. Although the partners plan to solicit many financial firms to take part in the service, it is unclear how eager others will be to offer service on a system owned by a potential competitor. IBM's potential customers may question what this venture means to their own videotex activities. Does the deal with Sears and CBS signal a commitment to a certain type of videotex service that may or may not mesh with home banking and other projects now being developed for use with IBM hardware?

■ **How important is telesoftware and off-line processing?** Electronic delivery and downloading of computer programs is a significant factor in the CBS-IBM-Sears plan; hence the intent to use personal computers with their storage capacity. The partners envision customers using such teledelivered data for education, home management and other off-line services. Such efforts also could play a factor in transmission of enhanced video images.

■ **What will it cost?** The partners turn aside speculation about rate structure, although a system such as the one proposed offers many opportunities for tiered pricing, pay-per-use services and ad-supported segments. Rates will be affected by the competitive situation at the time the services are introduced. A $20 per month user fee appears possible.

■ **Home or business market?** As currently planned, the service will be aimed at residential customers, capitalizing in particular on educational software. Nonetheless, the vast universe of office PC's will not be ignored, and that's a market the partnership apparently plans to examine.

■ **Telephone transmission only?** Although ideas about hybrid systems using cable TV or over-the-air formats persist, the current plans solely envision use of telephone lines. An executive at one company said that hybrids may be considered in the

distant future, but probably will play no role in the initial service.

That last point underscores the uncertain role of cable TV in the CBS-IBM-Sears plans. Through various means all three companies have access to cable channels, but for now, it seems no one plans to make use of that route.

1984 debut set for hybrid text service

Yet another new company is joining the teledelivery parade, marching along with NABU, Games Network and others eyeing hybrid interactive services via cable TV. Cabletex International Corp., a subsidiary of Cable Applications Inc., will launch a test of information services via a cable-telephone hybrid system late this year. Using a proprietary home computer and a database that it is designing and acquiring, Cabletex will offer a package of information, entertainment, shopping and banking services for fees expected to be in the $12 to $30 per month range.

Cabletex will negotiate with cable system operators for use of a full channel to deliver its services; it hopes to start a field test at three or four sites by year's end. The system will use a computer graphics system, but not NAPLPS, because that format is too slow for cable delivery, Cabletex vice president Robert Groll says. The package will include a dynamic database to deliver and download information that needs constant updating; static databases will be stored on optical discs at cable TV headends. Cable homes will use telephone lines for upstream interaction.

CAI, the parent company, is helping Cabletex develop a 64K home computer which will be leased as part of the monthly service fee (on top of a $200 installation charge). The keyboard portion will be connected to the terminal via an infrared link. An add-on RAM memory unit will allow the home computer to handle Visicalc and other off-the-shelf programs.

Cabletex is talking with grocery chains, banks and other institutions about offering service on the Cabletex system. Most of the information and entertainment packages will be acquired from outside sources. With its dynamic, high-speed graphics capacity, Cabletex

plans to include road mapping, educational and other services. Electronic mail (downloaded and stored at the recipient's terminal), airline reservations, home security and monitoring, theatre schedules and other features are planned for the system. The Cabletex marketing strategy involves sharing revenues with cable operators as part of an effort to encourage cable sales forces to peddle Cabletex as an added tier of cable service.

Store-bound

Homes aren't the only places targeted for electronic distribution. At least four companies have unveiled plans to deliver computer software—including videogames and educational material—to retail stores, where the programs will be duplicated for customers to carry home. The approach is to concentrate on the burgeoning computer retail shops, but some plans include high-traffic sites such as 7-Eleven stores. Presumably, the nascent cable TV store concept could figure into future efforts to market computer software through hybrid retail schemes.

Most of the efforts involve a duplicating device at the retail store. At the most recent Consumer Electronic show, Romox (the first to unveil its plans), Cumma Corp. (backed by Atari-founder Nolan Bushnell), Xante and Rom-Labs displayed their systems for in-store teledelivery. Some, such as Cumma, involve storing the computer programs on a hard disc in the duplicating machine; when a customer puts in coins and a "blank" cartridge, a program or game is duplicated for the user to carry home.

Other systems involve on-demand transmission of programs via phone lines or other means to the in-store duplicator. The plans now call for phone-delivered service, since most of the participating stores are in retail areas served by conventional telephone lines. Nonetheless, system developers seem open to any transmission system, including cable TV, which can effectively carry data into the stores.

Gary H. Arlen is President of Arlen Communications Inc., a Washington, D.C. research and consulting firm specializing in interactive communications services. He is editor of INTERNATIONAL VIDEOTEX TELETEXT NEWS and TELESERVICES REPORT, newsletters analyzing developments in those industries.

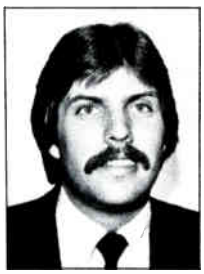
Mark Fehlig has been named broadcast sales manager for Harris Satellite Communications Division. Before coming to the Satellite Communications Division, Fehlig was manager of automation sales support for Harris Broadcast Studio Division.

P. Jensen

ADDA Corp.,manufacturers of digital television equipment for broadcast, cable and professional television applications, has appointed **Peter Jensen** chief financial officer and **Thomas Califano** Northeast regional manager. Previously, Jensen served as treasurer at Plantronics Inc., San Jose, Calif. Califano was affiliated with Math Associates, Westbury, N.Y., and Hitachi and Sony, in New York City, where he held marketing management positions.

Bob Virden was appointed executive assistant to the president and head purchasing agent for Satellite Reception Systems Inc. of Athens, Ohio. His new duties will include purchasing, corporate strategies and planning, and large house account sales.

Juan Martinez has been appointed sales engineer at the JVC Co. of America's West Coast branch. Martinez is the first person to have been selected into JVC's sales engineer program. He will provide technical support to JVC's Professional Video Division.



Reed Dawson has been named regional product specialist, connectors, at Panduit Corp. In his new position, Dawson will be responsible for product application and training. He also will work with the local sales office and distributor for sales and service of Panduit electronic connectors in the Panduit Midwestern eight-state region.

R. Brown

Tocom Inc. has elected **Richard Brown** manager of business planning and promoted **Dan Olsen** to Northern regional sales manager. Brown is responsible for the company's business and financial planning and budget forecasting programs in Dallas. Olsen will oversee sales and marketing activities in Tocom's Northern region, an area consisting of 18 states.

C-COR Electronics Inc. has promoted **Carolyn Stebbins** to supervisor, systems design. In her new post, Stebbins, who formerly served as bill-of-materials coordinator, will coordinate the design, drafting and "bill-of-material" functions of the C-COR's Systems Design department.

Lawrence Chatman Jr. has been appointed product manager, video teleconferencing products for the recently formed Telecommunications Sales Division of the Broadband Group

THREE SHORT YEARS

That's how long it took Zenith to become the leader in cable baseband technology.

How come so fast? Because Zenith has 65 years of electronics experience. We have the expertise, range of products and the engineering know-how to offer the most advanced and proven baseband cable system on the market.

Write us and learn about the Zenith Z-TAC addressable system. With unequaled program security, feature-packed, in-home terminals and versatile headend systems.

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Title_____

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Zenith Radio Corporation, 1000 N. Milwaukee Ave., Glenview, IL 60025, 312/391-8960

4/84/CED

ZENITH® CABLE PRODUCTS

Reader Service Number 34

of General Instruments. In his new post, Chatman will be responsible for marketing the General Instrument/Jerrold video teleconferencing line in the U.S. Prior to accepting the post with GI, Chatman served as product manager of OEM videotape recorder equipment for RCA Broadcast Video Systems in Camden, N.J. Meanwhile, several other personnel appointments at GI were announced. **Robert Cromack** was named vice president of operations for the Administration and Far East Broadband Group Operations. Previously, he was vice president for quality assurance, Jerrold Subscriber Systems Division. **Edgar Ebenbach** was promoted to vice president and general manager of Jerrold Canada and **John Tamblyn** was appointed vice president of administration for General Instrument of Canada.

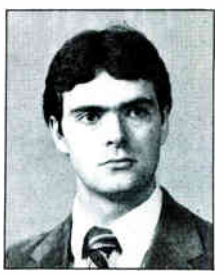
Satellite Television Corp. has named **Lawrence Brody** director, broadcast engineering and technical operations, and **David Durand** assistant vice president, subscriber equipment. Brody will be responsible for designing, building and operations of all broadcast and uplink facilities for STC's direct broadcast satellite (DBS) service. Durand will be in charge of all aspects of the subscriber home equipment systems through the manufacture stage and into the installation and operation phase of STC's DBS system.

Gilbert Engineering appointed **M.J. Jackson** South central sales manager. Before joining Gilbert, Jackson held various positions at Warner Amex in Dallas and was an evaluation engineer with UA Columbia.

Dr. Bruce Nassau has been appointed president of Telecrafter Services Corp., a wholly owned subsidiary of Telecrafter Corp. in Lakewood, Colo. Nassau had served as vice president of marketing; **James Koen** was recently promoted to that position.

Pico Products has named **James Mead** district sales manager for the Great Lakes Region of the U.S. Mead previously managed Pico's inside sales group, and prior to joining Pico, he was general manager of Adams-Russell's Norwood, Mass., system.

In response to rapidly growing business volume, Atlanta-based VideoStar Connections has expanded its staff and opened a Midwest regional office just outside of Chicago. **Johan Praats**, VideoStar's new Midwest region sales manager, will be in charge of the new office. Prior to joining VideoStar, Praats was international sales manager for McIntyre's Mini-Computer Sales Group Inc., based in Detroit.



Jay LaBarge has been promoted to the position of managing editor of the Microfilco Press of Microwave Filter Company Inc. of East Syracuse, N.Y. LaBarge was previously marketing manager of MFC's ham radio division.

The case for Cablecon® for CATV Trunks, Drops and Feeders.

If you're making underground CATV installations, Integral's Cablecon offers you unique, cost-effective benefits.

Versatility: Cablecon can handle any communications cable, including current fiberoptic/ waveguide cables, and provides an easy path for future modification.

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Proven technology: Cablecon is Integral's tradename for a cable-in-duct system that is being used in utility underground distribution; airport, street, parking lot and highway lighting; irrigation power and control cable; traffic signal loop and CATV applications.

Integral pioneered the cable-in-duct concept and continues to improve it.

Easy installation: Cables are preinstalled at the factory. Then, Cablecon is delivered to your job site, ready to plow or lay in an open trench. After manufacture, the cable is never touched until it is spliced. Cablecon protects your cable during shipping, and protects against rocks, rodents and chemicals in the ground.

Technical help: Integral's engineering staff can provide cable-tension, pull length and friction coefficient data to help you achieve a very smooth, easy and cost-effective installation.

Call 1-800-527-2168 for application or installation information.

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Integral Corporation
"Our 24th year"

Reader Service Number 47

EMPLOYMENT OPPORTUNITIES/HELP WANTED

RF ENGINEERS

MAGNAVOX CATV SYSTEMS, INC. has immediate career opportunities available for experienced R.F. Design Engineers. As a division of North American Philips Company, we have the support of a Fortune 200 company, including their proven track record of developing new and innovative products.

Candidates we seek will be responsible for the design and development of CATV distribution equipment. Qualified applicants will have a BSEE or equivalent and a minimum of three years design experience in CATV or related fields.

MAGNAVOX CATV offers an excellent salary and benefits program. Our relocation plan will ease the move to our facility in Manlius, (Syracuse) New York.

For consideration send resume with salary history to:

Professional Staffing Department
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A North American Philips Company
100 Fairgrounds Drive
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An Equal Opportunity Employer

Magnavox CATV SYSTEMS, INC.
A NORTH AMERICAN PHILIPS COMPANY
100 FAIRGROUNDS DR., MANLIUS, N.Y. 13104

CATV INDUSTRY

MANAGER OF APPLICATIONS ENGINEERING &
APPLICATIONS ENGINEER
Two Openings

GROWTH: RAYCHEM CORPORATION, one of the fastest growing companies in the Fortune 500, is rapidly establishing a position in the CATV industry.

OPPORTUNITY: We are looking for qualified individuals who can fill the above openings based in our **Menlo Park, California World Headquarters.**

Applicants should have a background in Electronics Engineering, preferably as an engineer in the CATV industry, be problem solving and hands-on oriented and have the imagination and creativity to help establish RAYCHEM as a leading supplier to the industry.

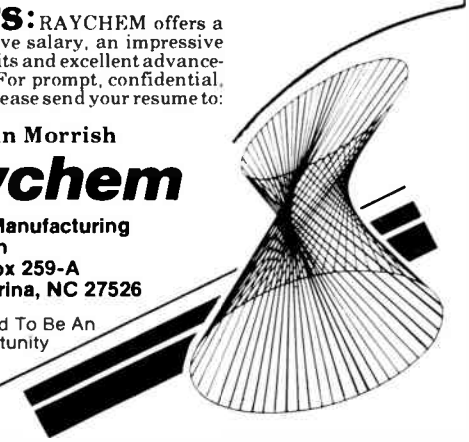
BENEFITS: RAYCHEM offers a highly competitive salary, an impressive package of benefits and excellent advancement potential. For prompt, confidential, consideration, please send your resume to:

John Morrish

Raychem

Raychem Manufacturing Corporation
Route 4, Box 259-A
Fuquay-Varina, NC 27526

We Are Proud To Be An Equal Opportunity Employer



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Texas Collect

TECHNICAL SUPERVISOR

Rapidly growing CATV organization seeks a technical supervisor to administer CATV test equipment and a amplifier repair. Contact:

Richard Richmond
(415) 651-4331
3270 Seldon Court #5
Fremont, CA 94539

STAFF ENGINEER

A New York City area MSO is seeking a degreed CATV system engineer. The candidate should have a minimum of 5 years of experience in a related position, have a general class radiotelephone operators license, have AML and longhaul microwave experience, and have earth station (TVRO) experience. Knowledge of digital electronics would be a plus. Good benefits and precs. Salary will be commensurate with experience. Kindly send resume and salary history to:

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TECHNICIANS • MARKETING
• SALES
(MSO or Equipment)

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P.O. Box 5727 T.A.
Denver, CO 80217-9929

BUSINESS DIRECTORY / PROFESSIONAL SERVICES

CABLEDEX

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Construction Chart

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Hardware Hotline

Ditch Witch vibratory plow

Ditch Witch has introduced an Onan gasoline vibratory plow that can install material to cover depths of 12 inches without trenching. The new 255SX is designed for work in areas where minimal turf disturbance is a priority. The four-wheel-drive machine features a side-oriented operator's station that allows the operator to walk in the direction the machine is plowing. The 255SK is 46 inches high and 32 inches wide; it can easily pass through a standard 36-inch-wide yard gate. The dry vibratory is mounted on a unitrolley with permanently lubricated filiment-wound composition bearings. Feed, pull and cable television blades are available.

For more information, contact Ditch Witch, The Charles Machine Works Inc., POB 66, Perry, Okla. 73077.

Blonder-Tongue ESHM modulator

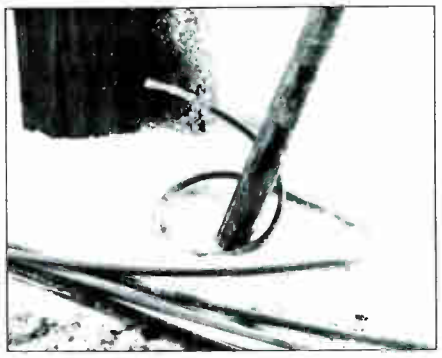
Two heterodyne modulators

Blonder-Tongue has introduced two modulators for VHF (2-13), midband (A-1) and superband (J-W) channels. The ESHM is a heterodyne audio/video modulator incorporating a SAW filter that provides a flat group delay and maintenance-free bandpass characteristics. A removable heterodyne module in a slide-out drawer makes for easy in-field channel changing. The MAVM is designed to put sound and color video on any unused channel of a closed circuit MATV or SMATV system. The MAVM's removable heterodyne converter board can be replaced for in-field channel changes.

For more information, contact Blonder-Tongue Laboratories Inc., One Jake Brown Rd., Old Bridge, N.J. 08857.

"Hazard-matched" electronic cable

Alpha's Omniguard 4, with jacketing insulation made of a thermo-elastic block copolymer, is engineered to resist high impact and weathering. According to the manufacturer, the cable remains flexible and performs well at temperatures ranging from -60° to +125°C. Omniguard is available in shielded and unshielded versions, with two types of cable armor, and in a wide range of jacket colors.



Alpha Wire Omniguard 4

For more information, call Alpha Wire Corp., 711 Lidgerwood Ave., P.O. Box 711, Elizabeth, N.J. 07207, (201) 925-8000.

High security apartment closure

Super SAFE, from Reliable Electric/Utility Products, is designed to prevent unauthorized entry. Made of heavy gauge steel, the closure features an interlocking cap. No "pryable" bolts or rivets are used in its construction. The Super SAFE is available in a variety of sizes that can accommodate different combinations of taps and closures.

For more information, contact Reliance Comm/Tec, 11333 Addison St., Franklin, Ill., (312) 455-8010.

'Max' to debut at NAB

Mycro-Tek plans to debut Mycro-Vision Max, its new low-cost, high-resolution character generator, at the NAB show in Las Vegas this April 29-May 2. The generator is a stand-alone device that utilizes non-volatile RAM storage and a built-in product-life battery, which provides the power for the system's memory. Other system features include: a backup memory, standard 32K memory that permits 120 pages of storage, two separate fonts for text and graphics, four display styles, the ability to interface with and gather information from two wire services simultaneously, and a built-in keypad.

For more information, contact Mycro-Tek, P.O. Box 47068, Wichita, Kan. 67201 945-5087.

Microdyne SMATV receiver

Microdyne has unveiled a new 24-channel satellite TV receiver, designated

continued on page 78

12 facts you should know about our addressable system

1 The overall cost of the Pioneer addressable system is the lowest of any major manufacturer in the cable industry.

2 It is the most convenient addressable system to install in your cable system, normally requiring less than an hour for Customer Service Representative training.

3 It is the only addressable system configured individually for small, medium and large size cable systems.

4 Pioneer's small headend finally makes addressability affordable for the small cable operator.

5 The Pioneer system—the headend, the converter and the software—were all developed in an actual operating environment.

6 Pioneer's software was not purchased from an outside source like most addressable software in the industry.

7 The software screens actually provide easy step-by-step instructions.

8 The system is designed to allow for change and growth. It will not become obsolete.

9 The Pioneer system includes a convenient, controllable remote unit for the home which makes illegal usage of the wireless remote impossible.

10 Pioneer has the highest proven reliability record of any converter manufacturer in the cable industry.

11 The Pioneer system offers a choice of scrambling methods, including one mode that is Jerrold compatible.

12 Our price. Call 1-800-421-6450

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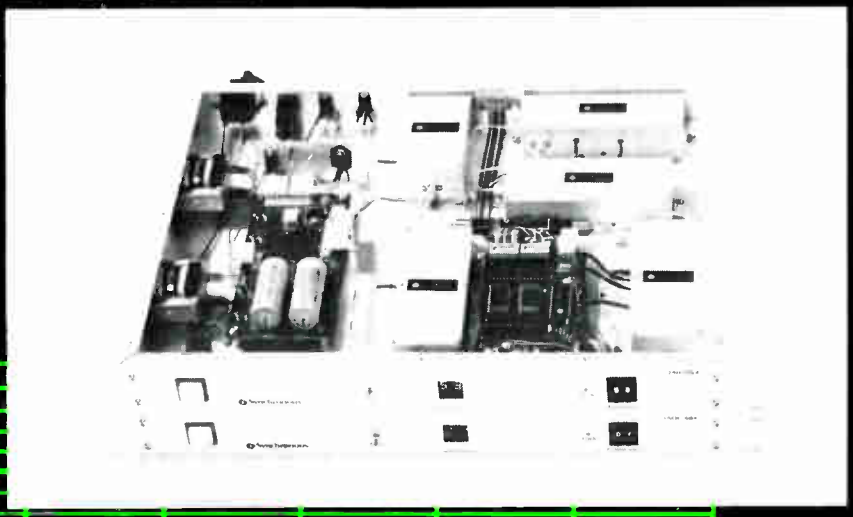
PIONEER COMMUNICATIONS OF AMERICA, INC.

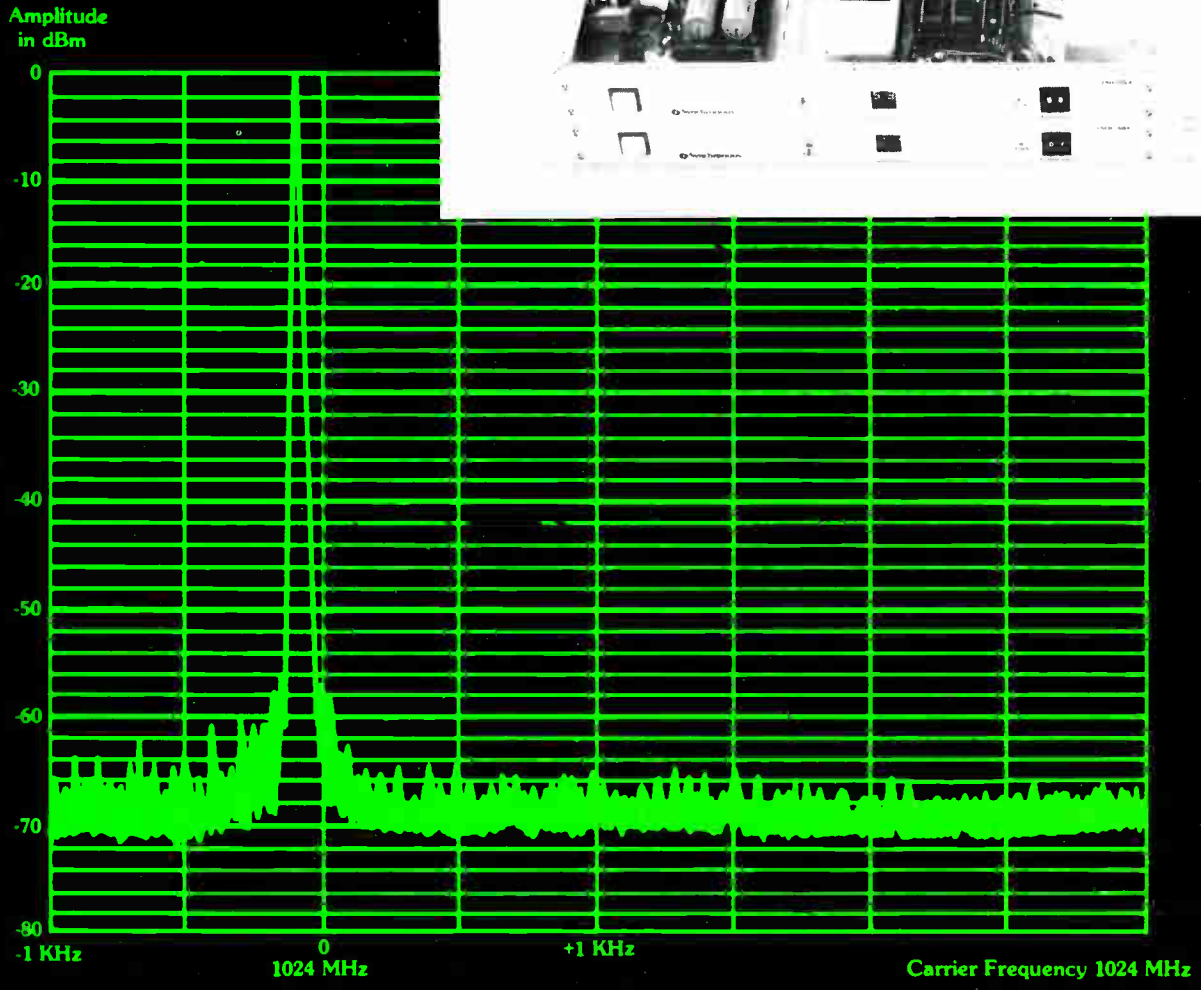
2200 Dividend Drive Columbus, Ohio 43228 (614) 876-0771

Reader Service Number 37

OUR NEW XL-SERIES FREQUENCY AGILE HEADEND CONVERTERS OUT PERFORM ALL OTHERS!

When selecting a Headend Agile Converter System to backup RCA, Jerrold or SA, select the best you can buy.





Reader Service Number 23

Synchronous COMMUNICATIONS, INC.

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HOW TO PULL THE PLUG ON CABLE TV THEFT

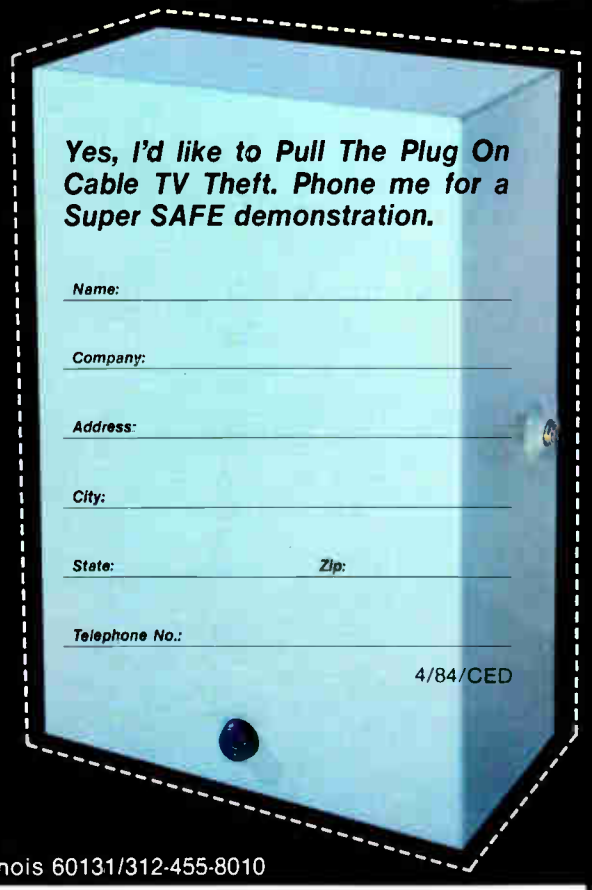
PLUG INTO SUPER SAFE

Start by fighting back with the industry's newest high security enclosure, Super SAFE. It works like a SAFE because it locks in cable service, that only you have the combination to. Now thieves and would-be viewers get only what they pay for!

You can bank on a Super SAFE because it is next to impossible to enter or destroy. Heavy-gauge steel construction and an interlocking cap quickly deter thieves. Plus, there are no bolts or rivets to facillitate illegal entry. For added security, all corners are welded.

Super SAFE is available in a variety of sizes and locking systems. Arm yourself with the one best for your system.

Act now for a demonstration on how we can pull the plug on your cable TV theft. Simply fill out the attached coupon and mail today.



Yes, I'd like to Pull The Plug On Cable TV Theft. Phone me for a Super SAFE demonstration.

Name: _____

Company: _____

Address: _____

City: _____

State: _____ Zip: _____

Telephone No.: _____

4/84/CED

Reliable Electric/Utility Products 11333 Addison Street/Franklin Park, Illinois 60131/312-455-8010

Reader Service Number 38

RELIANCE COMM/TEC

continued from page 72

the 1100 LPR. The receiver, available with automatic polarity switching and remote tuning-control features, is designed for small cable TV and SMATV use. Remote tuning is accomplished through a rear-panel mounted binary-coded decimal terminal that can receive switching instructions from a computer or standard switching device. In addition, the unit is equipped with dual RF inputs.

For more information, contact Microdyne Corp., P.O. Box 7213, Ocala, Fla. 32672, (904) 687-4633.

MFC introduces new filter

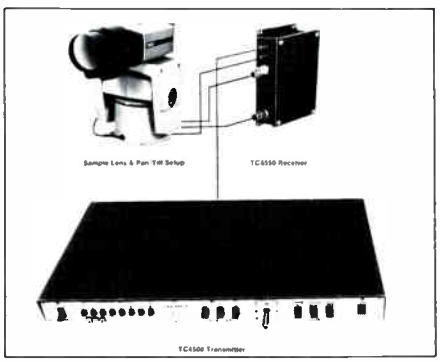
Microwave Filter Co. Inc. has designed a bandpass filter, the 4503, that can pass the 20 MHz wide band and measure available signal levels in DBS signal-level testing. The unit also can be used for other bandpass applications in the 950-1450 MHz IF band. Through the utilization of a relative signal level-measuring method, the filter selectively passes a desired transponder (F_0 ±10) while simultaneously rejecting adjacent signals by a minimum of 10 dB. The unit costs $690 and can be delivered in 10 days.

For more information, contact Microwave Filter Co. Inc., 6743 Kinne St., W. Syracuse, N.Y. 13057, (315) 437-3953.

Fiberoptic stripping tool

Augat Fiberoptics has released a stripping tool for use with optical fibers. Through the utilization of a patented design, the company claims the tool can remove the buffer without damaging the fiber. The tool is available either as a separate unit or in a kit with different stripping blades and tube guides. The kit costs $65 and the individual tool, $23.

For more information, contact Augat Fiberoptics, Augat Inc., 40 Perry Ave., P.O. Box 1037, Attleboro, Mass. 02703, (617) 222-2202.



RCA camera control system

TransCoax camera control system

The TC4500 Series TransCoax camera control system from RCA is designed to eliminate separate control cabling in surveillance installations. Table-top or rack-mountable control transmitters send encoded control signals up the video cable to on-site receivers that implement the variable speed, zoom, focus and iris-control commands. Two transmitter models are available: the TC4508, with a built-in vertical interval switcher, can control up to eight cameras; the TC4501 is a single camera control transmitter that can also be used with RCA V1400S Series Switchers to control multiple camera setups. The weather-proof NEMA boxed receivers required at each camera site have sealed "MS" style connectors. The receiver can be set to handle 24 VAC, 115 VAC or 115 DAC pan/tilts with or without Autopan. Two momentary and two latching auxiliary controls are provided. Selectable feedback from the site indicates the on/off status of a latching auxiliary; "Back-porch" video-clamping of control signals is used for hum and noise rejection. No "calibration" or other set-up procedures are required.

For more information, contact RCA

DAVID WILLIS, Chief Engineer for Tele-Communications Inc.

"**CED** is the technical pulse of the industry . . . I like **CED**'s in-depth series, the technical information, new product information and charts. I use the charts, even have one here on the wall . . . We read **CED** from cover to cover!"

CED

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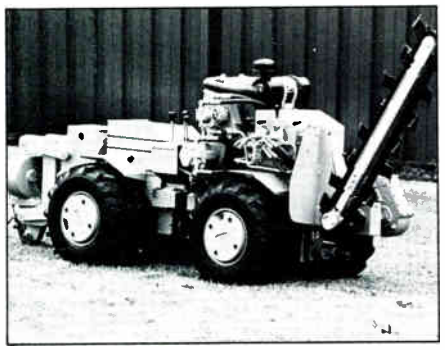
Closed-Circuit Video Equipment, (717) 397-7661.



Burkeen DP30 plow

Burkeen DP30 plow

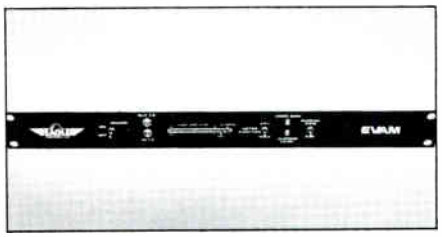
Like the DP30 cable plow it replaces, Burkeen's new model incorporates such "contractor-tested" features as a Hatz diesel engine, articulation, a spring-isolated plow and gearbox-driven trencher. The updated model also features a lower profile for better stability, a larger hydraulic reservoir, a redesigned and less cluttered hydraulic system, a heavier basic unit for better traction, an hour meter, muffler guard, key switch and trencher safety bar. "Big Foot" tires, heavier wheels and a more powerful boring attachment are offered as options.

For more information, contact Burkeen Manufacturing, 11200 High Point Cove, Olive Branch, Miss. 38654, (800) 895-9824.

Macom/OEM augments product lineup

The DC4 from Macom Industries/OEM Enterprises is a four-port directional coupler in a diecast case with side entry and vertical ports. DC4 is available in 6 isolations: 8, 12, 16, 20, 24 and 30 db. It covers frequencies from 5-900 MHz with CATV quality specifications and is two-way compatible. Its anti-corrosion chromate finish and over-90 dB RF shielding add to its versatility. Also available from Macom are two models of open-frame, 19-inch-wide headend equipment racks. Model MOR-61 is 61 inches tall; MOR-71 is 71 inches tall. Both have 12 gauge uprights and 16 gauge bases and brackets. Mounting rails are tapped with EIA RS-310C standard holes for 10/32 screws and finished in gray hammerstone.

For more information, contact Macom Industries, 8230 Haskell Ave., Van Nuys, Calif. 91406, (818) 786-1335.



Eagle video amplitude monitor

Automatic video amplitude correction system

The EVAM—Eagle Video Amplitude Monitor—from Eagle Comtronics helps alleviate video signal problems like tearing, jamming, flashing, buzzing and streaking by automatically correcting the baseband signal and thereby stabilizing the video input into a modulator. This technique corrects distortion due to video variation, changes in switching between different sources, changes in satellite demodulation, picture bleeding, excessive bright or dark pictures, audio buzz and inadequate scrambling associated with channel over- or under-modulation.

For more information, contact Eagle Comtronics, 1111 James St., Syracuse, N.Y. 13203, (315) 428-8635.

An old line company... in a new line of business!

Poleline Corporation is the newest member of the RMS Electronics family. RMS Electronics, Inc. has been in operation for over 35 years.

PRODUCTS MANUFACTURED for various divisions of RMS Electronics, Inc. and available to the Cable Television Industry through Poleline Corporation include:

Poleline Hardware

■ Thimble eye bolts ■ Machine bolts ■ Suspension clamps ■ Support strand ■ Lashing wire ■ Tap and amplifier brackets ■ Lashing clamps ■ Crossover clamps ■ Guy-grip Dead-ends ■ False Dead-ends ■ and more.

Cable TV Products

■ Moulding Duct ■ Non-Power Passing "Raceway" Splitters and Directional Couplers ■ Apartment Amplifiers ■ Antenna/Cable TV Switches ■ Feed-thru Bushings ■ Ancillary Hardware ■ and more.

Poleline Corporation also distributes products such as:

■ Heat Shrink Tubing ■ Moulding Duct ■ Prewire Apartment House Boxes ■ Cable ■ Lashing Machines ■ Pedestals ■ Test and Measuring Equipment ■ Ground Rods ■ Marker Tags ■ Tools ■ Silicone Grease ■ Ladders ■ Safety Equipment ■ Ancillary Hardware ■ and more.

Poleline Corp.

Subsidiary of RMS Electronics, Inc.

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In California (800) 247-8435

Reader Service Number 42

Westar V

Signal	Day	Start/Stop	Alert Tone	Transponder
FNN	Weekdays	(E) 7 a.m./7 p.m.	975*/#	**1D**
Madison Square Garden	Daily	7 p.m./1 a.m.	None	**8D**
The Nashville Network	Daily	(E) 9 a.m./3 a.m.	674*/#	**9D**
National Jewish Network	Sunday	1 p.m./4 p.m.	None	**12X**
Select TV		24 hrs	None	**3D**
University Network		24 hrs.	None	**1X**
WOR-TV		24 hrs.	None	**2D**

Major Communications Satellites Serving North America

Location: Degrees West Longitude	Satellite: Present	Future
41	TDRS 1***	
67		Satcom 6**(5/86)
69		Spacenet 2***(9/84)
72	Satcom 2R**	
74	Galaxy 2**	
76		Telstar**302 (3/84)
76	Comstar D1/2*	
79	Westar 2**	
81		ASC1***(9/85)
83	Satcom 4**	
86		Telstar 303**(5/85)
87	Comstar D3**	
89		SBS 4* (8/84)
91	Westar 3**	
93.5		Galaxy 3** (5/84)
95	SBS 3*	
96	Telstar-301**	
97	SBS2*	
99	Westar 4**	
100	SBS 1*	
103		Gstar 1* (3rd Q/84)
104.5	Anik D1	
105	Anik C2*	
105		Gstar 2* (4th Q/84)
108.5		Anik C1* (6/84)
109	AnikB1***	
109	Anik D2** (11/84)	
114	Anik A3**	
117.5	Anik C3*	
119	Satcom 2**	
122		Spacenet 1*** (4/84)
123	Westar 5**	
127	ComstarD4**	
128		ASC2*** (9/86)
131	Satcom 3R**	
134	Galaxy I**	
136	Satcom 1**	
139	Satcom1R**	
143	Satcom 5**	
171		TDRS2*** (late/84)
TBD		Spacenet 3*** (early/85)

* Ku-Band
** C-Band
*** Dual C/Ku-Band

Orbital slots and launch dates often change without notice.

Westar IV

Signal	Day	Start/Stop	Alert Tone	Transponder
SIN		24 hrs.	None	**3x**

Comstar D-4

Signal	Day	Start/Stop	Alert Tone	Transponder
Country Music Television		24 hrs.	None	**9H**

Galaxy 1

Signal	Day	Start/Stop	Alert Tone	Transponder
C-SPAN		24 hrs.	295*/#	**13**
The Disney Channel	Daily	7a.m./11p.m	617*/# 834*/# (E)	**(E,C) 4 (M,P) 24**
Galavision	Weekdays Weekends	4p.m./4a.m. 24 hrs.	None	**20**
HBO		24 hrs.	None	**(E) 23**
The Movie Channel		24 hrs.	None	**(W) 14**
SIN		24 hrs.	819*/#	**6**

Satcom 4

Signal	Day	Start/Stop	Alert Tone	Transponder
BizNet	Weekdays	7 a.m./2 p.m.	None	**15**
Bravo	Weekends Weekdays	5 p.m./6 a.m. 8 p.m./6 a.m.	513*/#	**2**
FNN: Financial News Network	Weekdays	7 a.m./7 p.m.	975*/# 738*/#	**2**
KKGO-FM		24 hrs.	None	**17**
National Christian Network	Daily	24 hrs.	073*/#	**7**
The Playboy Channel	Daily	8 p.m./6 a.m.	869*/#	**12**
SCAN		24 hrs.	None	**3**
SPN	Weekdays	5 a.m./12 p.m.	None	**3**
Trinity Broadcasting Network		24 hrs.	None	**17**

Satcom 3R

Signal	Day	Start/Stop	Alert Tone	Transponder
AP News Cable		24 hrs.	None	**6**
Arts & Entertainment	Daily	8 p.m./4 a.m.	311*/# (E,C,M) 519*/# (P)	**1**
Cable Jazz Network		24 hrs.	None	**8**
CBN		24 hrs.	414*/# (E,C,M) 715*/# (P)	**8**
Cinemax		24 hrs.	None	**(E,C) 20 (M,P) 23**
CNN		24 hrs.	024*/#	**14**
CNN Headline News		24 hrs.	635*/#	**15**

Services using Satcom 3R transponders not listed above will appear in next month's In Orbit.

Contact programmer's technical department for more information on transponder use and alert tone.

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