CED™

Communications Engineering Digest/The Magazine of Broadband Technology

October 1983

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- **Upgrades make dollars and sense**
- **New section: Teledelivery**

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Reader Service Number 1

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The vast resources of ANCOM's two parent companies, ALCOA and NEC, assure a DBS system unmatched for performance. ALCOA's sophisticated metallurgy and knowledge of mass production. NEC's years of experience in satellite electronics and low-cost, high-volume semiconductor applications. Plus extensive experience by both companies in marketing products directly and through distribution to professional users and consumers.

ANCOM is the best choice for any company entering 12GHz broadcasting on any scale. We are ready, willing and able to supply tomorrow's technology today...in the quantities and configurations to fit any individual purchaser's needs.

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TWX 910-222-5991 (ANCOM ELGR)
Reader Service Number 3

CED™

October 1983

Reader Service Cards available in this issue.

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M/A-COM LINKABIT's Video Cipher.

About the cover

Photographer Rob Stuehrk captured the analogy of scrambled pay services by cooking up three dozen eggs and adding to his gas bill in order to convey the idea behind this month's cover story.

Roart

A CLOSER LOOK AT ROART'S REINFORCED PEDESTAL
— Now Competitively Priced and Superior to Steel —

Multiple Layers...

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— **NON-CORROSIVE** — Fiberglass cannot rust and is favored in coastal, tropical, and alkaline soil areas. Reduce maintenance costs by not having to replace unsightly, rusted-shut or structurally-affected pedestals.

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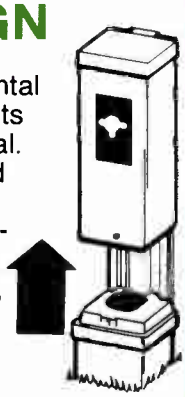

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Reader Service Number 4

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Techscope

A standby warning

A federally issued warning on power assemblies has been made public to cable operators and other companies that use standby power equipment. The Occupational Safety and Health Administration announced the hazard alert, declaring that there are "substantial hazards associated with the operation and servicing of battery-operated standby power supplies such as those used by cable television firms." Such batteries, the agency stated, should be equipped with adequate venting apparatus plus an overcurrent protective device. Without such safety valves, OSHA said, batteries could develop potentially explosive hydrogen gas or release corrosive fumes. While OSHA has not established a rule nor law requiring the addition of the suggested safety equipment, Tab Wilson of Cable Safety Systems, which offers safety venting systems for standby battery supplies, said only 1,000 out of an estimated 51,000 standby power supplies in use in the U.S. are equipped with OSHA's recommended equipment. Cable Safety Systems is located at P.O. Box 20428, San Jose, Calif. 95160, (408) 268-0908.

Ad-supported videotex service to debut

VideoLog, an ad-supported business-to-business videotex service, will be unveiled at the WesCon Electronics Conference and Exhibition Nov. 8-11 in San Francisco. The new offering will serve as an on-line product catalog for the electronics industry, according to officials at Videotex Information Corp. Personal computers, ASCII terminals and AT&T Sceptre videotex terminals will be able to access VideoLog using telephone lines. However, the company later plans to expand the service to cable as well. According to President Alan Brigish, when that expansion takes place will be a function of how fast two-way interactive headend technology develops. "It will happen as soon as the systems become available," he said.

Sammons signs security agreements

Sammons Communications has made two recent moves in the security realm; one with the Dallas police and another with Cableguard Inc., an independent purveyor of cable-related security services. The arrangement Sammons concluded with the Dallas police called for the installation of new cable lines and use of a strand already in place for a closed circuit television security surveillance system, nicknamed "video cop." The system, which Sammons developed with the Dallas police, operates in a four-block radius of shops and businesses in the University Park area of the city. Video signals from six remote cameras installed in three locations in the area are transmitted via cable to the police station, where the monitoring takes place. The agreement in principle Sammons reached with Cableguard Inc. allocates one channel in the Sammons system to Cableguard for the provision of security services. According to Jim Rosene, director of public relations for Sammons, the company formerly provided its own security services to subscribers, but due to a variety of factors and principally to an inability to capitalize on efficiency in numbers, Sammons decided to lease the channel to Cableguard.

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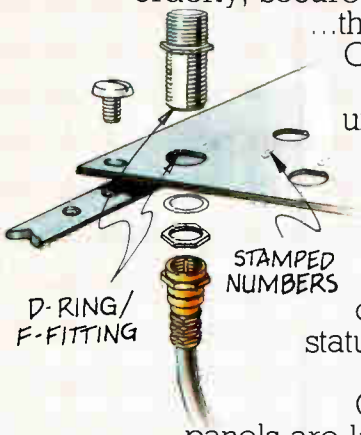
CWY created a way to make tangled, inefficient multiple dwelling enclosures orderly, secure and easy to service ...the revolutionary new Omni-Rack™ system*. The Omni-Rack's unique panel and rail design means quick and easy auditing, connecting, disconnecting and changing subscriber status. Leads connected to the underside of Omni-Rack punched panels are labeled permanently by stamped numbers on the tops of the panels. Once leads are connected, they need never be touched again—checking or changing status means handling only jumper cables. Plus, for additional security, the Omni-Rack comes with exclusive aluminum-coated log cards which may be kept away from the enclosure.



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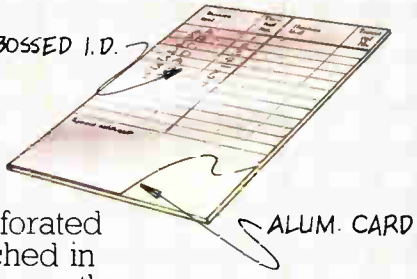

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Reader Service Number 7

Seminars

October

2-4: The annual convention of the **Pacific Northwest Cable Communications Association** will be held at the Sheraton Hotel in Spokane, Wash. Contact Hank Sexton Jr., (206) 357-9381.

3-5: The third annual conference on videotex sponsored by **Ohio State University** will be held at the Hyatt Regency Hotel in Columbus. Contact W. Wayne Talarzyk, (614) 422-5725.

3-6: The Eight Data Communications Symposium, jointly sponsored by **IEEE Computer Society, IEEE Communications Society** and **The Association For Computing Machinery**, will be held in Cape Cod, Mass. Contact Andreas Salazar, (201) 834-3740.

3-7: A **Community Antenna Television Association** advanced technical training seminar co-sponsored by the **Texas Cable Television Association** will be held at LaQuinta Motel in San Antonio, Texas. Contact (305) 562-7847.

4-6: A **Blonder-Tongue** MATV/ CATV/LPTV/TVRO technical seminar will be held at Ceasar's World in Atlantic City, N.J., in conjunction with **L-C-A Sales**. Contact Craig Kemper, (201) 679-4000; or L-C-A, (914) 961-4700.

4-6: LPTV East, sponsored by the **National Institute for Low Power Television**, will be held at the Sheraton Washington (D.C.) Hotel. Contact Darlene Geller, (203) 852-0500.

5-7: University of Wisconsin—Extension, Department of Engineering & Applied Science is conducting a tutorial on "Community Antenna Television Service: Equipment Availability, System Design, Terminology." Contact Francis P. Drake, (608) 263-7427.

8-10: The '83 Sat Expo sponsored by **Xorrox Corp.** and **University Graphics Inc.** will be held at the Red Lion Inn, San Jose, Calif. Contact Andy Gibbs, (408) 978-8212; or Lloyd Covens, (303) 759-1099.

10-11: The annual convention of the **Iowa Cable Television Association** will be held at Stouffer's Five Seasons Hotel in Cedar Rapids. Contact Neil Webster, (319) 252-1343, or Jon Lash, (319) 395-7801.

10-14: The Fiber Optic Communications and Local Area Networks Exposition organized by **Information Gatekeepers** will be held at Bally's Park Place Hotel in Atlantic City, N.J. Contact (617) 739-2022.

11: The **Bay Area Cable Club** and the **San Francisco Bay Area Chapter of Women In Cable** will sponsor their third "Channeling Into Cable" seminar on the technical aspects of cable TV for the non-technical at Gallagher's in Oakland, Calif. Contact John Cribb, (415) 785-6077; or Patricia Trosclair, (415) 485-0813.

11-12: A seminar on "Telephone Bypass Technologies and Economics" sponsored by **TeleStrategies Inc.** will be held at the Hyatt Arlington in Washington. Contact (703) 734-7050.

11-13: The fall convention of the **Alabama Cable TV Association** will be held at the Grand Hotel in Point Clear, Ala. Contact David Dea, (205) 476-7657.

11-13: A **Jerrold** technical seminar will be held in Williamsport, Pa. Contact Diane Bachman, (800) 523-6678 or (215) 674-4800.

11-13: A workshop on "CATV Management, Engineering and Operating Principles" sponsored by **abc TeleTraining Inc.** will be held in Chicago. Contact (312) 879-9000.

12-14: Magnavox CATV Systems will hold a field training seminar with its Mobile Training Center in Richmond, Va. Contact Laurie Mancini, (800) 448-5171; in New York, (800) 522-7464.

17-19: Magnavox CATV Systems will hold a field training seminar with its Mobile Training Center in Richmond, Va Contact Laurie Mancini, (800) 448-5171; in New York, (800) 522-7464.

18: A meeting of the **International Association of Satellite Users** will be held at the Twin Bridges Marriott Hotel in Washington. Contact Donna McCaughey, (703) 437-5457.

18-19: The sixth annual **Newport Conference on Fiberoptic Markets** will be held at the Sheraton-Islander Inn, Newport, R.I. Contact Kessler Marketing, (401) 849-6771.

18-20: The 26th annual convention of the **Mid-America Cable TV Association** will be held at the Hilton Plaza Inn, Kansas City, Mo. Contact Rob Marshall, (913) 887-6119.

19-21: The eighth annual conference of the **Public Service Satellite Consortium** and **Services by Satellite** will be held at the Washington (D.C.) Hilton Hotel. Contact (202) 331-1154 or 331-1960.

25-27: A **Jerrold** technical seminar will be held in Nashville, Tenn. Contact Diane Bachman, (800) 523-6678 or (215) 674-4800.

26-27: A seminar on "Cable Video Conferencing: Institutional and Municipal Uses" sponsored by **Berks Community Television** will be held at the Sheraton Berkshire Inn, Reading, Pa. Contact Ed Ciesla, (215) 374-3065.

30-Nov. 1: The "1983 National Over-the-Air Pay TV Conference and Exhibition" sponsored by the **Subscription Television Association** and the **MDS Industry Association** will be held at the Century Plaza Hotel in Los Angeles. Contact Lavonne Meyer or Valerie Scarbrough, (213) 821-3598.

November

1-3: The **Atlantic Cable Show** will be held at Atlantic City Convention Hall in Atlantic City, N.J. Contact (609) 848-1000.

1-3: The Western Design Engineering Show & Conference, to be held at the Los Angeles Convention Center, will be sponsored by **The American Society of Mechanical Engineers**. Contact Western Design Engineering Show & Conference, (212) 370-1100.

1-3: A **Blonder-Tongue** MATV/ CATV/LPTV/TVRO technical seminar will be held at the Ramada-Court of Flags in Orlando, Fla., in conjunction with **Enjay Associates**. Contact Betty Karas, (201)679-4000; or Enjay, (813) 953-9843.

2-3: Titsch Communications will sponsor a seminar entitled "Financial Opportunities in Mobile Communications" at The Union League Club in New York. Contact Beverly Mang or John Winsor, (303) 295-0900.

Looking ahead

Nov. 1-3: Atlantic Cable Show, Convention Hall, Atlantic City, N.J.

Dec. 11-12: NCTA's National Cable Programming Conference, Biltmore Hotel, Los Angeles.

Dec. 13-15: Western Cable Show, Anaheim Convention Center, Anaheim, Calif.

Jan. 18-20: Texas Show, San Antonio Convention Center, San Antonio, Texas.

Feb. 6-8: National Mobile Communications Expo, Disneyland Convention Center, Anaheim, Calif.

March 5-7: Society of Cable Television Engineers Cable-Tec Expo '84, Opryland Hotel, Nashville, Tenn.

June 3-6: National Cable Television Association convention, Las Vegas (Nev.) Convention Center.

Texscan is dedicated solely to the cable television industry.

Texscan places all of its manufacturing, engineering, research and development, and service energies into providing you with the highest quality products at the lowest possible cost.

Texscan provides you with the technical expertise of specialists located at each division.

And Texscan has grown solely to serve the cable industry.

Since 1976, Texscan has acquired companies which provide you with strong, established cable product lines, and at the same time, lower system costs. While each of these divisions is part of the Texscan family, each is operated like a smaller company, maintaining its own separate customer service department, sales and engineering staff, manufacturing facilities, and inventories. And each is backed by the Texscan 18 year reputation for quality, innovation, low cost, and responsive sales service support. When you need answers quickly, you get them. No waiting. No passing the buck. And no getting lost in the large company shuffle.

From test equipment to character generators to distribution equipment to addressable and non-addressable converters and more, Texscan brings you the most complete selection of cable products anywhere. All backed by the world's largest independent supplier of proprietary cable television equipment. For more information, call our toll-free number or write:

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Phoenix, Arizona 85061
(602) 252-5021
(800) 528-4066

Reader Service Number 10

Programming is expected to be available by January 1984, although converters will not be installed until February of that year. Estimated subscriber fees are set for $6.00 per month per home.

The announcement signalled a major order for Pioneer Communications, which has experienced a good year, according to Larry Shredl, sales manager for Pioneer. "Business has been good," he said. "Standard converters have picked up and so have the 36- and 58-channel boxes."

Pioneer's philosophy is to offer converters for a broad spectrum of cable systems, from the sophisticated Warner Amex QUBE operations, which features the company's premium BT-1300 two-way addressable system, to the smaller converters serving systems from 12 channels up.

"With small systems upgrading from 12 channels who have anywhere from 5,000 to 10,000 subscribers, they're not interested in buying a $100 box, but will put their money into a $30 box," Shredl said.

Nevertheless, Pioneer is not lost on the value of larger capacity converters geared for 450 MHz systems. At the Eastern Show, the company introduced its new wireless remote 67-channel converter that will be labeled the BC-4000 series. The BC-4000 incorporates the quality and reliability of Pioneer's BC-2000 series converters, while the full remote keyboard and special features add convenience for subscribers and greater flexibility for operators, such as a parental control feature. Another feature is the "favorite channel memory" with capacity for 10 programmable channels that the subscriber can enter to scan his preferred programs. The converter will be available in December 1983.

Shredl commented on the Just For Listening proposal and the growing interest in audio services as new revenue sources. "The cable operator is looking for inexpensive ways to get in the customer's house for less money. With Durborow's plan and our boxes, it will cost the operator about $25 per home. That's very efficient."

Profile

ComSonics surges ahead

Having completed expansion to its facilities, ComSonics charges forward with plans to enter new markets

HARRISONBURG, Va.—Contrary to the cautious, "wait and see" approach adopted by many cable hardware manufacturers and suppliers during this period of industry slowdown, ComSonics, an employee-owned and -run firm located in Harrisonburg, Va., is surging ahead with plans to enter new markets and extensive additions to its headquarters recently completed.

ComSonics is a service company as well as a manufacturer. Strand mapping, system design, signal survey, FCC testing and equipment repair are but a few of the services it provides the cable operator. The company also manufactures test equipment and other related hardware and sells equipment that it refurbishes.

The additions to its Harrisonburg facilities, which were completed this June, effectively quadrupled the size of the company's previous operations. Such expansion, claims Carl Hensley, ComSonics vice president of sales and corporate development, does not represent a sudden rise in business, but rather signifies a long overdue resolution to a problem that had been plaguing the company for some time—the need for more space. With the two new wings, the company now can house its research, design and development department under the same roof as its management, repair and other company departments. The additional space also accommodated expansion of the company's repair laboratory, equipment inventory and shipping and receiving areas.

Carl Hensley, (left) ComSonics vice president of sales and corporate development, consults with members of the firm's R & D group on new equipment design.

Commensurate with, but not a direct result of its building expansion, was the company's decision to extend its repair services to include video exciters and to offer a one-year warranty on all extended bandwidth equipment 270 MHz and up that it repairs. When asked if the warranty's coverage would apply to other types of equipment in the future, Hensley said, "We're going to offer it on some of the test and headend equipment — the latest generation stuff. Of course, we can't warranty a calibration on a meter for a year because they just don't hold that long. But we can warranty against defects in parts."

While the one-year warranty has generated only a "few takers" to date, Hensley excuses the less than enthusiastic response to the fact that "we haven't really pushed it (the warranty) in the media yet. We're making sure we have all the wrinkles out."

According to Hensley, ComSonics is considering augmenting the repair end of its business, which comprises about 50 percent of its annual sales, with the provision of turnkey service. The service, if implemented, could take any number of forms and might even involve operating with a contractor, in which case ComSonics would supply some refurbished equipment while also providing strand mapping, system design and final system proofing services.

Data communications is another area that has captured the company's attention. A few products which officials declined to identify are already on the drawing board or in various prototypical stages of development. These products most likely will offer applications for interactive systems and institutional networks. According to Hensley, however, the company feels no pressing need to rush the development of these products since "there's not much going on (there) right now."

Aside from data, an R&D project involving the monitoring of complex machinery through the use of microprocessors has also just been completed. As in the former case, Hensley refuses to elaborate on the project's nature, saying only that "It was a monitoring of some complex equipment, monitoring different parameters and giving it certain instructions to make it more energy-efficient and to be more self-diagnostic." ComSonics hopes to start production on these units in the next month or two.

Hensley was far from reticent, though, when describing his company's feelings toward the computer and microprocessor-based test equipment fields: "We're heading that way (into the development of computer-related equipment) as fast as we can go. We think it's a natural. Even in this industry, more and more of the test equipment is becoming microprocessor-based. And I think it's a natural on interactive systems to have these devices talking, so to speak, to each other."

In addition to these pursuits, ComSonics plans to continue its endeavors in the repair and test equipment arenas and is currently investigating alternative means of financing a Western equipment repair operation. Delivery on a new type of status monitor system that works in conjunction with the company's well-known "sniffer" device is scheduled to begin soon. The company has also indicated interest in the European markets with efforts to affiliate itself with at least one European nation already underway.

—Constance Warren

■ The Board of Directors of NCTA has announced the appointments of new committee chairmen to serve on NCTA's 1983-1984 Engineering Committee. In addition, Cox Cable Senior Vice President Gary Tjaden was re-appointed as chairman of the committee. New committee members include:
Bradford Anderson, Wideband Data Corp.;
Alex Best, Scientific-Atlanta;
Frank Bias, Viacom International;
Henry Cicconi, Sammons Communications;
Frank Dejoy, Suburban Cablevision;
Robert Dickinson, E-COM;
Brian Garrett, Comm/Scope;
Geoffrey Gates, Cox Cable Communications;
James Grabenstein, Microdyne Corporation;
Stan Guff, Oak Communications Corp., Inc.;
Michael Jeffers, Jerrold;
Bradley Johnston, Group W Cable;
Jeffrey Krauss, M/A-COM Laboratories;
Bernard Lechner, RCA Laboratories;
Robert Luff, UA Cablesystems;
F. Ray McDevitt, Warner Amex;
William Petty, Capital Cities;
Thomas Polis, Communications Construction Group;
Joseph Preschutti, C-COR Electronics Inc.;
Frank Ragone, Comcast;
Robert Rast, American Television & Communications Corp.;
Cliff Schrock, CableBus Systems Corp.;
Abe Sonnenschein, Hughes Microwave;
Gary Stanton, Southern Syndicated Systems;
Dom Stasi, Warner Amex Satellite Entertainment Co.;
James Stilwell, TeleService R & D;
Scott Tipton, Home Box Office;
Joseph Van Loan, Viacom Cablevision;
Norman Weinhouse, Hughes Microwave Communications; and
Seymour Yusem, Columbia Broadcasting System.

■ Magnavox CATV Systems Inc. has named Labgear Ltd., Cambridge, England, a distributor of its CATV systems equipment. Labgear, which began distributing Magnavox equipment in early August, now will distribute Magnavox equipment exclusively throughout the United Kingdom.

■ Mycro-Tek has signed Video Midwest Inc. as a distributor for the Mycro-Vision™ video information display system. The distributorship agreement was announced by Mike Burton, Mycro-Tek's national sales manager.

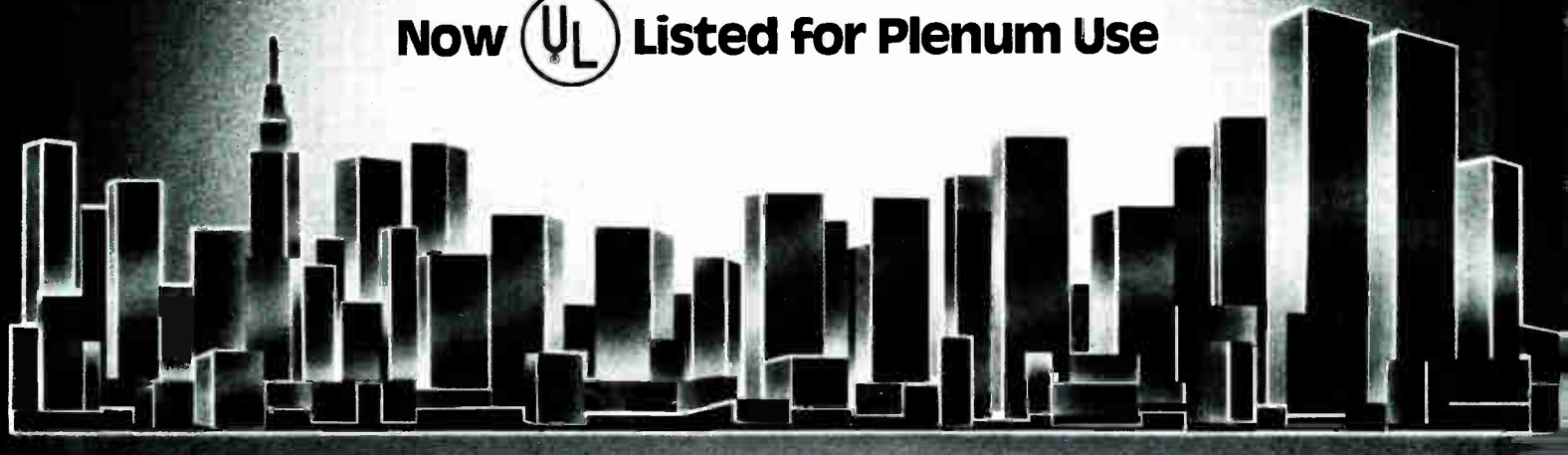
■ Texscan Corp. has announced that construction has begun on a new facility in El Paso, Texas. The 125,000 square foot, dual-level building will be located at 1440 Goodyear Drive and will provide approximately 75,000 square feet of warehousing space, with another 50,000 square feet allocated for engineering, data processing, purchasing, accounting, and material control.

Texscan also has announced a major sales agreement with Cablentertainment, an Iselin, N.J.-based MSO. According to the agreement, Cablentertainment will use Texscan's distribution equipment in the construction of over 200 miles of cable plant and will also purchase a large supply of Texscan MSI character generators,' according to Robert Baum, Cablentertainment's president.

■ Cable TV Supply Co. Inc. is negotiating an agreement with TPM to market TPM products to the CATV industry. Pending the signing of the agreement, Cable TV Supply anticipates making TPM products, which are currently being developed, available to the cable television industry in the spring of 1984.

FUSED DISC M-III

Now (UL) Listed for Plenum Use



General Cable's 13.0mm (.500") Fused Disc M-III coaxial cable is now (UL) listed and classified for plenum installation. Receipt of (UL) listing for all sizes is anticipated in the near future.

Contact your General Cable Sales Representative for a catalog and a sample or call the Customer Service Center at 800-526-4385 or in New Jersey 201-636-5500.

General Cable Company CATV DIVISION

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Reader Service Number 15

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TFC'S ADVANCED ENGINEERING BRINGS YOU A MOISTURE-PROOF DIELECTRIC WHICH STRIPS CLEAN QUICKLY.

T4 coax cable has a precisely extruded moisture barrier which provides long term protection—yet it strips cleanly from the center conductor. The integrity of T4's copper cladding need not be compromised by repeated cutting or scraping; or by melting with a propane torch and wiping with an abrasive pad, as actually proposed by a leading competitor for stripping their cable.

T4's homogeneous moisture barrier, with TFC's specially formulated chemical bonding and coating agents, is readily removed with the foam during stripping, leaving no deceptive, transparent residue. This results in the most efficient use of splicing labor for fast, perfect terminations without compromising connector performance.

You will never have to trade off easy strippability for moisture resistance with T4. To get a hard, moisture-proof dielectric that strips clean for long-term reliability, specify T4 coaxial cable from TFC.

To obtain a sample of this remarkable new T4 cable, please contact TFC today at P.O. Box 384, Wallingford, CT 06492, (203) 265-8482. In Canada, call (416) 475-1412.

Reader Service Number 17

TFC TIMES FIBER COMMUNICATIONS, INC.
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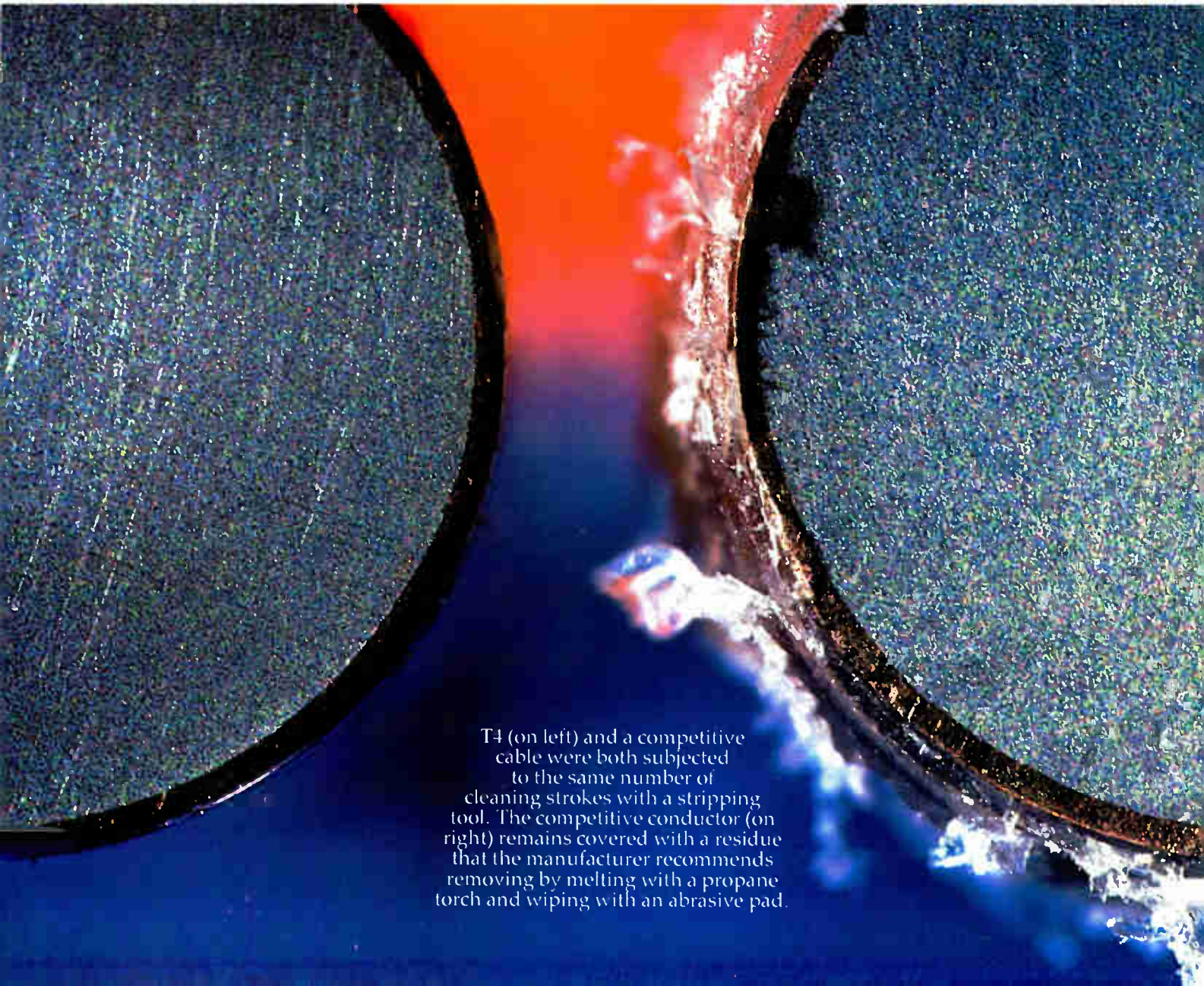


T4 (on left) and a competitive cable were both subjected to the same number of cleaning strokes with a stripping tool. The competitive conductor (on right) remains covered with a residue that the manufacturer recommends removing by melting with a propane torch and wiping with an abrasive pad.

AT&T, Coleco join forces

AT&T & Coleco Industries plan to distribute video games via phone lines

HARTFORD, Conn.—This past month, American Telephone & Telegraph Co. (AT&T) and Coleco Industries Inc., a toy and game manufacturers based here, announced plans to collaborate in an effort involving the distribution of video games and entertainment software via telephone lines.

According to officials from both firms, the joint venture entails the development of a modem capable of transmitting video games and other software services through standard twisted pair telephone wires to subscribers' home computers and videogame players. If all evolves as planned, the modem will be able to interface with a variety of home computers and video players and thereby overcome one of the major shortcomings afflicting similar types of services on the market today: the inability to communicate with more than one or two manufacturers' computers or video players.

While the specifics of the plan, delegation of responsibilities and actual roles each firm will assume in the plan's implementation have not yet been disclosed, many believe it is safe to assume that AT&T, with its technical expertise, will produce the modems, while Coleco, with its software inventory and ingenuity in programming, will provide the accompanying programming and software services. Marketing of the video game system will probably be handled by both firms through their own and other companies' distribution outlets.

Despite the high rate of success one might envision for this type of service, electronically-delivered games in the past have not been blessed with overwhelming good fortune and prosperity. Mattel Inc. and General Instrument Corp.'s PlayCable, a 24-hour video game channel that debuted in 1981, has fewer subscribers than at once anticipated and rumors abound that the service will soon shut down. Similarly, Control Video Corp., which manufactures a $60 modem capable of transmitting games by phone to owners of Atari videogame players and Coleco adapters, has claimed a total of 1,500 subscribers over the two-month period since it first introduced the service.

Although AT&T and Coleco are in a position to benefit from the mistakes made by others before them, many of the pitfalls that confronted Mattel, General Instrument and Control Video could conceivably endanger the AT&T/Coleco project as well. Software developers afraid that electronically-delivered games will threaten their businesses might be reluctant to release titles. A second fear is that phone lines may be tied up too long during the transmission of games to encourage subscribers to continue the service.

Regardless of what obstacles the venture may face, a variety of factors exist in the project's favor. First of all, both AT&T and Coleco bring strong reputations and proven experience in the computer and high-tech fields to the venture. Secondly, the two companies together possess access to a large distribution network and a few hundred distribution outlets that undoubtedly are capable of reaching most prospective clients.

Both firms stand to profit indirectly from the venture as well. Coleco will gain increased exposure to videogame and home computer owners, which should help it procure marketing rights for software. AT&T, on the other hand, will be able to establish a presence in the home computer market through the venture and thereby prove its commitment to diversify and expand into new fields not directly associated with the telephone industry.

Coleco expects the modem to be completed sometime next year and the service to be made available shortly thereafter. Reports from the financial community estimate the modem to cost less than $100. Coleco and AT&T, however, have yet to confirm these conjectures.

—*Constance Warren*

UCLA invades telco turf

By owning world's largest private phone system, UCLA adopts new role

LOS ANGELES—By setting what appears to be an industry record, The University of California at Los Angeles has overstepped the boundaries normally ascribed educational institutions and augmented its image as purveyor of knowledge with a new role as telecommunications trendsetter.

Last July 15, the university completed installation of its own private telephone system. According to Sandra Hardy, associate architect for UCLA, the UCLA system boasts a total of some 900 miles of cable and is capable of accommodating 26,000 hand sets, although only 21,000 have currently been installed. However, what is most important about the system, Hardy explains, is that it is presently the largest operational privately owned telephone system in the world. At least for the time being, she adds.

UCLA first became interested in the idea of installing its own phone network when it realized the significant cost savings involved. Current university projections forecast cost savings in the neighborhood of $15 million over a 10-year period through use of its own system over that of AT&T.

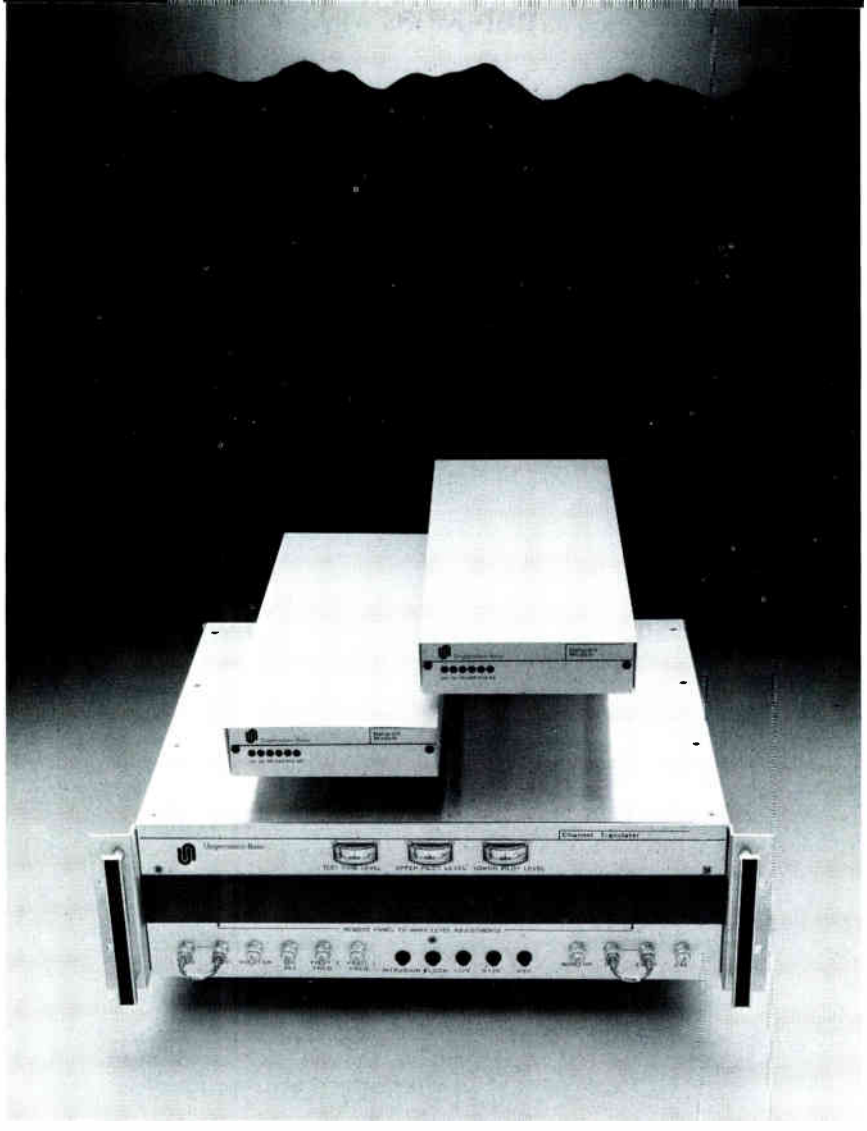
Installation of the network, which Hardy estimates cost somewhere around $30 million, required construction of approximately half-a-dozen duct banks in the university's underground utilities system, which connects most of the school's buildings; a 24-count duct bank to connect the hospital to the main building; and new duct systems in some of the older buildings where existing ducts were inadequate for telephone networking purposes. Extensive underground conduiting also was necessary as was the installation of a special cable, insulated with DuPont's "teflon" FEP fluorocarbon resin, in building plenums. This type of cable enabled the university to comply with existing building codes while saving $ 5 million over other cable insulating techniques.

Northern Telecom was the prime contractor for the system, selected by the University several years earlier. As part of its bid, Northern Telecom built the UCLA network based on its SL-100 system.

UCLA is currently using the electronic switch, which is the core of the entire telephone network, for telecommunications purposes only, Hardy explains, although she admits the system "does have the capacity to transmit data."

When asked if the university had plans to integrate the telephone system with the school's computer facilities at some later date, Hardy was noncommittal and skirted the question somewhat, saying only: "I suppose there's always a possibility. That would probably be a political question in telecommunications."

Perhaps the most intriguing aspect of the UCLA system is the way it is set up, as a private phone company operating within the confines of a large university. The



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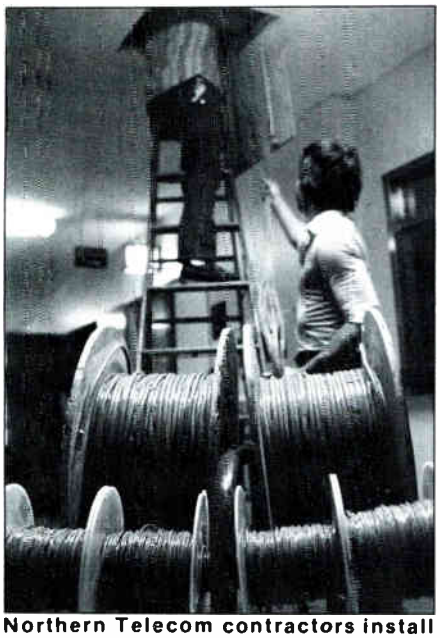
system, more appropriately referred to as the UCLA Telecommunications Department, bills each one of the university departments separately for their phone use. Upon receipt of their respective phone bills, each department becomes responsible for paying the Telecommunications Department for their phone use in much the same manner they would pay AT&T or any other service company. As a distinct entity, the UCLA phone department is, in turn, responsible for issuing the bills, maintaining the system, training and hiring employees and for operating within the confines of its own budget.

As of yet, no students have received phones or been linked up to the service. Hardy believes this is because the UCLA Telecommunications Department doesn't "want the liability of giving them (the students) phone bills."

Phones, however, have been installed in residential hall offices and students have access to a general telephone system that operates in student dormitory rooms. Both systems interface with outside and long distance lines.

According to Hardy, other institutions have expressed interest in copying UCLA's system. Among those she cited as having interviewed UCLA officials involved in the project were representatives from Stanford University, Lockheed Aircraft, McDonnell Douglas and Ford Motor Co.



Northern Telecom contractors install UCLA's private phone system.

Elizabeth Downing, marketing communications specialist at DuPont, says her firm has been contacted by at least one university interested in following UCLA's example. According to Browning, this university, whose name she prefers not to divulge, is contemplating installing a system that would interconnect 107 buildings, using DuPont's teflon cable in the buildings' interiors.

If these organizations do decide to implement their own phone services, as both Hardy and Downing predict is highly likely, UCLA's current reign in the telecommunications domain will become precarious indeed. Perhaps, in that case, the university will have no other choice than to settle with its more traditional role as teacher and disseminator of scholarly information.

Time Inc. retrenches

Time announces intention to drop teletext project

NEW YORK—"Change" seems to be the word that most accurately epitomizes the current mood prevailing within the corridors and offices of the multimillion-dollar conglomerate Time Inc.

On Sept. 15, the company surprised the cable industry with its abrupt announcement that it would discontinue *TV-Cable Week*, its weekly cable guide. One week later, Time made news again when its president, Richard Munro, indicated that the firm plans to withdraw from the teletext venture it initiated not too long ago.

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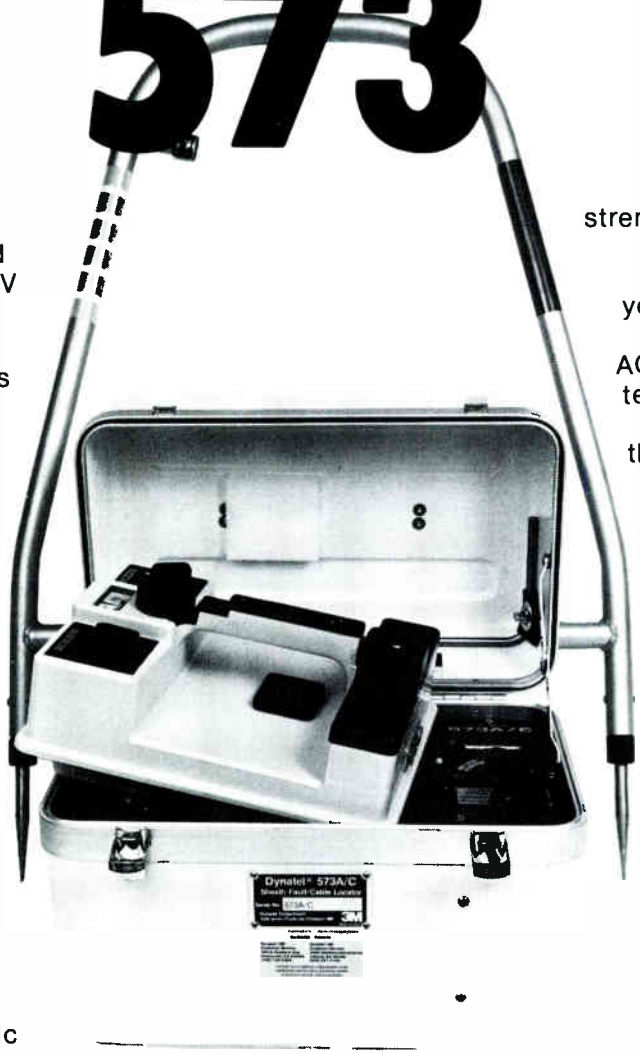

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Munro labeled the service "a research and development item that is too early" to be introduced for consumer business and referred to results of a recent test that estimated potential subscriber usage for the service at an average of only 15 minutes per day.

Perhaps, Time officials, who two years ago touted teletext as a profitable complement to other Time entertainment services on the market, were discouraged by these statistics, which, when considered along with the $1,000 price tag on the home computer necessary to receive the service, suggests a less than economically viable future for the teletext service.

Munro and Time officials, however, were careful not to imply that an economically viable future for teletext does not exist. On the contrary, Munro and other Time officials argued that the service could become feasible from an economic standpoint if the cost of the home computer or other unit required to receive the service dropped to $150 or less.

Munro also emphasized that Time wouldn't abandon the project immediately or abruptly: "You'll see us winding (teletext) down. We got into it too soon." He added, "I'm not announcing the closing of teletext today."

Other companies currently offering teletext services are, for the most part, concentrated in the broadcasting industry, with CBS and Westinghouse among the firms with the largest interests in the field.

As for what future actually does lie ahead for teletext, officials observing the industry have different opinions. Some believe teletext holds potential in the advertising world as a new advertising medium; others expect the service to glean revenues as a pay TV subscription service. Still others envision a less optimistic future for the service and feel it will be surpassed by home computer networks using cable television or phone lines as the conduit in which information for games, computer programs and other applications is transmitted.

Whatever the case may be, Time hasn't indicated it will close the door forever on teletext. As one official noted, "We believe the field holds long-term promise."

Florida network

Florida constructs an 800 mile intrastate network

BOCA RATON, Fla.—Construction of an 800-mile intrastate communications network is underway, according to officials from Microtel, the firm that concluded negotiations this July with the Florida East Coast Railroad for jurisdiction to lay the network under the railroad's right-of-way.

Once completed, the system wil extend from Miami to Jacksonville, with links to be provided between Tampa and Naples and from Orlando to Lake City. An east/west connection from Tampa to the Titusville area will also be installed.

The network will use 12-fiber "ChannelMax™" fiberoptic cable manufactured by Valtec and FT3C lightwave terminal equipment from M/A-COM, DCC.

Common delay

Albuquerque Cable fights common carrier status

ALBUQUERQUE, N.M.—The cable system serving this capital city is still awaiting a final decision from the State Corporation Commission on whether it must call itself a common carrier when offering data transmission services. Albuquerque Cable, a Tribune Co. system, has been experimenting with data transmission via cable with one local business.

The commission, acting on a request filed by Mountain Bell, which wants a statewide probe of cable data transmission, will delay its vote on Albuquerque Cable's status until the system begins offering data service on a commercial, wide scale basis. One cable official said the move to a commercial status could be within months, provided the service is feasible and cost-effective.

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News briefs on business communications

■ **The KEYFAX joint venture between Satellite Syndicated Systems and Keycom Electronic Publishing, has approved the sale of KEYFAX decoders for special cable TV industry use.** According to Southern Satellite Systems Inc., the company marketing the system, a limited number of units will be made available for purchase by each company interested in experimenting with the new text service. The purpose of the offering is to allow the overall members of the cable industry an opportunity to become familiar with this new medium. Southern Satellite Systems claims the KEYFAX service is the only national, commercially active teletext project in the United States.

■ **US WEST has reached agreements with NEC Telephones Inc., Technicom International Inc. and TIE/Communications Inc. to supply communication systems and terminals to US WESTS's yet to be named business communications subsidiary.** The company also said preliminary agreements were in the works with Ztel Inc. and AT&T Information Systems for similar equipment and communications systems to be supplied to the US WEST subsidiary. The NEC agreement calls for US WEST to market the recently announced "NEAX" 2400 information management systems. US WEST will offer the 416 from Technicom, and specialized business terminals, larger key systems and the digital voice data systems from TIE. Once agreements with Ztel and AT&T are solidified, US WEST will offer the PBX from Ztel and the Merlin from AT&T Information Systems.

■ **Skylink Corp. is offering a personal satellite phone, a five-pound cordless communicator that provides basic communication to isolated parts of the U.S.** The system will serve individuals, vehicles and unattended equipment located at or traveling in areas beyond the reach of existing telephone systems.

Skylink also has filed an application with the FCC to construct and launch a high power satellite to relay voice and data signals from the personal satellite phones back into conventional telephone networks. In the plan submitted to the FCC, local telephone companies would act as the primary retail outlets for the new service.

■ **RCA American Communications Inc. is marketing a long-distance satellite private line telephone service linking the San Antonio area to other major U.S. business centers.** The service offers savings, RCA Americom reports, of up to 40 percent over comparable terrestrial services. The service also can be used for business-to-business message, data and facsimile transmission.

■ **Campus Network Inc. has purchased five video centers from Scientific-Atlanta.** These video centers use Scientific-Atlanta's new multiplex analog components (MAC) system. The order represents the first application of MAC for video transmission. Campus Network plans to install the video centers on college campuses by October 1983. According to S-A officials, the sale represents the first phase of Campus Network Inc.'s planned nationwide network of satellite-delivered entertainment and educational programs to colleges and universities.

■ **Harris Corp. has been awarded a contract from Waterway Communications System Inc. (WATERCOM), Jeffersonville, Ind., for the design, manufacture, construction and maintenance of a marine telephone system covering more than 4,000 miles of inland waterways.** Total value of the turnkey contract is estimated at $12 million. When completed, the system will provide commercial vessels on the Mississippi, Ohio and Illinois rivers and the Gulf Intracoastal Waterway with automatic, direct-dial telephone service. The network will incorporate a TDMA (time-division-multiple-access) controlled signaling channel and radio-telephones to interconnect the network with conventional land-based telephones.

Harris Corp. also is planning to build a new 230,000 square-foot plant in Malabar, Brevard County, on Florida's east coast. A ground-breaking ceremony for the $20 million facility was held last month. Construction is scheduled to be completed by September 1984. The plant will be used for manufacturing, assembling and testing of advanced information processing and communication systems for the U.S. Government.

Headend Encryption and Signal Security

Removing pirates' "key" to theft of service

By Tony Wechselberger
Director, Advanced Engineering
Oak Communications Inc.
Rancho Bernardo, Calif.

Encryption, based on cryptographic techniques developed for the military and diplomatic communities, can be combined with advanced baseband scrambling to provide improved security in systems that are in the user's home, and, even more importantly, systems that cannot be breached easily by products that can be mass produced.

Encryption requires that the message information be digitized. Once digitized, it is then encrypted using an invertible transformation determined by a digital word called the "key." The encrypted message is transmitted and then encrypted using the same key.

These new technologies are aimed at plugging the drain in operator profits, referred to as theft of service and estimated by Showtime to be as high as $391 million yearly, thus making extensive legal programs for prosecuting pirates unnecessary.

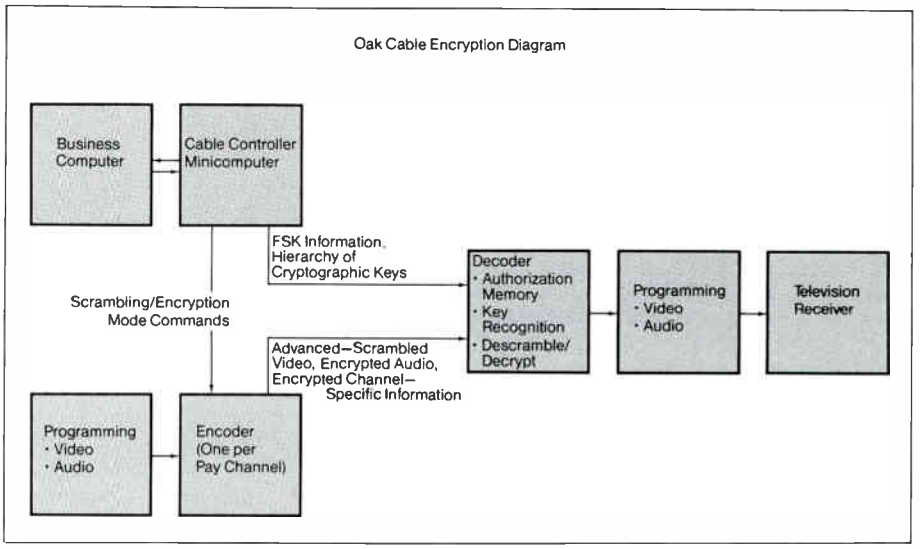
Cable Security

There are two alternatives open to the person who would steal cable programming. The pirate can either tamper with his or her decoder to receive pay services, or he or she can buy or make pirate equipment and tap the cable line to receive programming. The result is the same—reduced profits for the cable operator. A secure system would not be outwitted by either of these approaches.

Cable system suppliers have focused on both physical and electronic security. Physical approaches include making it difficult for a home user to get into a decoder box, or difficult to alter the wiring once inside. Electronic approaches have until recently concentrated on analog scrambling techniques. Encryption is now being applied to cable security and holds the promise of creating highly secure systems cost effectively.

Security is a matter of degree. When developing a security system, one must ask these questions about the pirate:

- How intelligent is he or she?
- What resources does the pirate have?
- How much information about the system will the pirate be allowed?
- What is the pirate's motive?



In the most secure system imaginable, the answers to these questions would not matter. In the real world, a truly secure system will be one that cannot be defeated by:

- a bright electronic engineer;
- with substantial financial and technical resources;
- whose motive is to profit by producing pirate decoders.

When these criteria are applied to the different technological approaches to securing cable signals, the relative weaknesses and advantages of each approach begin to separate them.

In contemporary addressable systems, there are three kinds of information transmitted through the cable: video, audio and control; two realms in which to secure this information: analog and digital; and two places the security can be implemented: in the modulated radio frequency (RF) carrier or the unmodulated baseband signal.

Those techniques that allowed the easiest encoding at the headend and decoding at the receiving end (analog scrambling at RF) were the first choices of the fledgling cable industry because they were relatively less expensive than the alternatives. But ease of illicit decoding made these systems prey for pirates. (For a review of scrambling technology, refer to Karl Stephan's article in the July 1981, issue of *CED*.)

RF Video Scrambling

RF video scrambling was originally popular in the cable industry because it does not require demodulation and remodulation in the decoder. Therefore, it reduces hardware expense. RF scrambling achieves its end by altering the video-modulated carrier by adding to, subtracting from, or multiplying the wave form so that it is not recognized in the normal fashion by the television receiver.

In square-wave sync suppression, for example, the normal video-modulated RF signal is multiplied by a scrambling signal, which is an unsymmetrical square wave phase-locked to the horizontal sync frequency. This square wave causes a variable attenuator to switch between two different values of attenuation. The active video part of the signal goes through at the normal level, but during the blanking interval, just before and after the sync pulse, the signal (horizontal blanking pulse) is attenuated so that is falls below the normal video.

When the receiver's sync clipper reads the signal, it interprets the active video portion of the signal as the sync pulse, and the true sync pulse falls across the middle of the screen image as a wavy bar. The image is practically unviewable.

In descrambling, the signal is multiplied by an inverse square wave, which boosts those parts of the signal the first wave attenuated. The decoding timing information is usually transmitted on the scrambled channels' audio subcarrier.

While this does an admirable job of scrambling the signal, it is vulnerable to attacks from both box tamperers and

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pirate box manufacturers. The decoder is fairly simple and easy to understand, so the pirate can easily alter the decoder to receive additional pay channels. Moreover, the components are inexpensive and easily assembled. So a cottage industry in pirate decoder boxes has been born.

Time Varying Scrambling

There are a number of other ways to scramble the RF video carrier, including video inverson, the interfering-carrier system and sine-wave sync suppression. And there are variations possible within these types.

This makes "time varying" scrambling possible. Time varying is a characteristic of a scrambling system that changes so that a decoder operating at some time N will not properly descramble at time N+1 unless it adapts to the change.

With time varying scrambling, the system's security is determined by which characteristic changes, how often and according to what pattern it changes, and the degree of difference between N and N+1. These changes are usually simple perturbations between degrees of sync pulse suppression, alterations of the scrambling tone, and so forth, and give the pirate box the added difficulty of having to follow the changing modes of scrambling in order to decode properly.

Encryption

In encryption, the characteristic that changes (the key) is now a digital word. In an addressable system, the key can be easily changed, and our figure of merit, the distances between N and N+1, can vary enormously since the number of possible keys is large, and the keys can be frequently and easily varied.

The encrypting transformation is chosen from a family of transformations or algorithms. The algorithms are implemented in computer hardware or software in the (headend) encoder and the decoders, and enable a very large number of different encryptions through the applicaton of the key variable selected by the headend controller. The algorithms, key variables and key distribution methods and their implementation, are known as the cryptographic system and must be planned carefully.

The total number of keys in the system is known as the key space, and each transformation has its own key. So the controller selects an encryption key, tells the encoder to encrypt in that key, and tells the decoder to decrypt in the same key by sending the decoder the selected key.

The separate keys are, of course, kept secret, but can be changed if they are compromised. Since the secrecy of the keys is essential to the system, the keys too are encrypted during transmission.

Although the number of keys is finite, the number of keys possible in a word with N bits is 2^n. So the number of possible keys rises very rapidly with the number of bits in the word. If it should turn out that someone has the computer time and programming ability to determine the key, the keys themselves can be easily changed by the headend and would be as a normal precaution anyway.

Oak Encryption

Oak's scrambling concepts were originally developed for its STV systems in Dallas and Portland and field tested for two years; they have also been applied to Oak's Orion satellite security system. They are applicable to cable operations and, considering current revenue losses to signal theft, can be an excellent solution to the problem.

It would be ideal to encrypt both the video and audio information transmitted over the cable. But that would be prohibitively expensive in dollars and bandwidth. Instead, Oak applies advanced baseband scrambling techniques to the video, digitizes and encrypts the audio, and requires proper encoding of encrypted control channel information in real time to undo these processes.

The Oak system does not just suppress the horizontal sync pulse, it completely eliminates it as well as the vertical sync pulse information from the headend scrambled signal. The video signal also is treated with random inversion on scene change. (This maintains the quality of the descrambled picture by avoiding flicker.) The end result is the undecoded signal is severely scrambled and requires precise and difficult to regenerate timing to descramble.

The other program information carried by the cable is the audio, which can be digitized without overly expanding the bandwidth. Once digitized, the information can be encrypted. Oak embeds the digitized and encrypted audio in the baseband video at the location where the horizontal sync pulse normally is.

Also embedded in the video is channel-specific encrypted digital information, which is necessary to decode the particular channel. This information is carried in the first few lines of each field, where the vertical sync pulse informaton would normally be.

General authorization control commands, which are frequency-shift key (FSK) modulated, are sent out globally on a carrier at 104.75 or 112.7 MHz. Both channel specific and FSK information sent to the decoders includes "digital signatures" which authenticate that the information has been sent by the system controller and not by some other controller or tampering device.

Therefore, the decoder must be authorized from the headend to decrypt, and it must receive specific information contained in the control channels to enable it

Privacy, not piracy

With scrambling technology taking on more importance, a number of companies are positioning themselves in an attempt to attract businesses principally from the remaining pay services that have yet to select a particular encryption system.

Among those companies that are the most prominent is M/A-COM LINKABIT, Inc., which received the lucrative HBO contract to provide the pay service with a scrambling device. LINKABIT will provide its VideoCipher System to 5,000 HBO affiliates as specified in its contract. LINKABIT will use two fully redundant uplinks and secure the west coast feed in early 1984 and do the same for the east feed later that year, according to Mark Medress, assistant vice president of the video products group. Field tests begin in October, stretching on to November with the company "right on schedule."

The VideoCipher scrambles the video signal by a time-shuffling technique controlled by the Data Encryption Standard algorithm of the National Bureau of Standards. This complex process renders the picture completely unintelligible to all but the properly authorized descramblers, making the video signal many times more secure than other techniques such as line rotation, line inversion or sync suppression.

LINKABIT originally manufactured equipment for digital modulation, error coding and encryption for the U.S. military and NASA. However, the company became interested in applying its technology to commercial use and demonstrated its VideoCipher security system to HBO in late 1982. Medress said that HBO had been formulating scambling plans for three years. HBO selected LINKABIT in early 1983.

At this point, the company is fulfilling its order with HBO and is seeking additional contracts with the other pay services.

"Naturally, we'd like to see the other pay services select the VideoCipher," Medress said. "This would create a defacto standard system for the industry, with the advantage that operators can shift the equipment around."

LINKABIT has not ignored the DBS market and is at work now to develop VideoCipher II, a modified version of the existing system, which will be available in September 1985.

A second company that has much experience in the scrambling industry is Videonet Inc., which handles all the

Continued on p. 34

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NCS Industries, Inc., (215) 657-4690, Wash.DC.,MD,DE,E. PA,VA,S. NJ • Cable Technology Associates, Inc., (315) 422-9012, NY,CT,RI,MA,VT,N. NJ,NH,ME

Reader Service Number 24

to do so. The authentication procedure ensures that the itinerant pirate cannot feed false information to the decoder to defeat the system. The authentication information is encrypted, as are the audio decryption keys and the keys can be changed frequently.

Decoding this encrypted and scrambled signal requires precise timing, which has only been made economically possible by the development of custom large-scale integrated circuits. Even if the pirate were able to reproduce a decoder, he would certainly require a great deal of time and money to do so, and it would not be profitable to go into business manufacturing boxes or kits. Such a system has required a great many years of experience to perfect.

Moreover, the pirate who buys service and wishes to increase his or her service level at the cable operator's expense would find it very difficult to do so because of the encrypted channel-specific information and the global update of decoder authorizations from the headend controller.

The object of the system is to put the cable operator in control. This approach allows for user-specific pay tiering, because each channel has its own decrypting informaton. The system also allows for varying levels of security through different mechanizations of audio and encryption control by a choice of two key distribution scenarios.

Briefly, this is Oak's view of encryption's value to the cable industry and an overview of its new SIGMA system which implements these ideas. With a system that combines digital encryption techniques for audio and control information, advanced baseband video scrambling with both horizontal and vertical sync pulse removal and encrypted video inversion commands, the cable operator can protect and increase revenues by using advanced technology rather than embarking on costly legal problems to apprehend and prosecute cable pirates.

The technology will have them beat.

Multi-purpose 'MAAST'

MAAST is a "multiple applications addressable secure television" system developed by Telease Technology Inc., a subsidiary of Telease Inc., for the broadcast, cable, MDS, SMATV and DBS markets.

The system, which Telease claims can access 16 million subscribers through individual decoders and one MAAST box located at the headend, uses a proprietary technique, called TIES, to transmit encrypted information from the headend to the subscriber's decoder.

Various levels of security are provided by the system through a tiered-key system and a choice of operating modes. The tiered-key system is comprised of four keys—a master key for preventing

Continued from p. 32

scrambling services for the boxing industry. Videonet works with all fight promoters—Don King, Top Rank, Main Events, RSVP—using the Orion system developed by Oak. Videonet is itself a part of Oak Industries, which controls the majority interest and also handles the scrambling of Oak's On TV stations and horse racing events from several states.

Videonet started out in 1979 carrying satellite seminars before moving to videoconferencing. When the company realized that most of its clients were businesses that required confidential meetings, it decided to enter the scrambling field. Videonet's first scrambled boxing event was the Larry Holmes-Jerry Cooney fight in June 1982. The company intends on staying in the scrambling business to serve principally "intermediate networks that can't afford a full scale scrambling system off the bat," said David Badoud, Videonet's national marketing manager.

In addition, Scientific-Atlanta, California Microwave and Vitek all offer signal security systems. S-A's multiplex analog components (MAC) system was developed by its subsidiary, Digital Video systems, which also uses a DES algorithm. It is designed to offer large screen projection of direct satellite transmission. S-A recently announced that Campus Network Inc. had purchased five MAC systems to be installed on campuses where it holds exclusive franchises for programming.

California Microwave formally announced in early September its mode CD5800 Digital Encryption System operating from 75 bps to 5 bps for government and industrial applications in data, voice and voice networks. In addition, the company keyed its announcement with the receipt of a $1.1 million order from "a Fortune 500 corporation," according to a company spokesman.

Vitek calls its signal security "Paysaver," which it says is an "inexpensive way to secure signals." The Paysaver is a specially constructed trap which reinforces the security of converter/descramblers.

In this age of increased theft of service, stemming from home-built converters and taps to full scale piracy, the moves toward securing signals either at the home or by satellite, are beginning to make inroads on the accountability of pay services' signals. As pay TV and ultimately basic services, select the scrambled and encryption route, the potential for maintaining the privacy of signals is greatly increased.

CED

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PTS Corporate Headquarters: P.O. Box 272, Bloomington, IN 47402

Reader Service Number 26

unauthorized migration of MAAST decoders; a unit key that is unique and permanently associated with each decoder; a month key specifically encrypted for each decoder and down-loaded each month for billing purposes; and a program key for identifying each program—and an initializing vector that synchronizes "pseudo random binary sequence" generators for scrambling and unscrambling audio.

The operator can attain the highest level of security by choosing to operate in the SyR (sync removal) video mode. In this mode, encrypted information contained in the four keys and initializing vector is continuously sent to the subscriber's MAAST decoder, which receives the transmitted information, verifies the subscriber's status, establishes the legitimacy of his request and, if the request is proven legitimate, creates the synchronization signal necessary to produce a normal picture on the subscriber's TV set. According to David Block, manager, licensee services for Telease, this type of "military level" security effectively precludes theft since subscribing to the service is less expensive than duplicating the LSI circuitry that enables the terminal to decode a specific program or audio channel.

Security is not the only service the MAAST system purportedly offers subscribers and operators alike. A control lock on the decoder provides the subscriber with the ability to "lock out" an undesired channel, to categorize and "lock out" programs according to a 10-tier increasingly restrictive rating system and to "lock off" the decoder's impulse pay-per-view feature.

Through an LED display on the decoder, MAAST alerts the subscriber to the coming of a pay-per-view event. If interested, the subscriber can press a cost button on the decoder, which displays the price of the event on the LED. The subscriber then either presses twice on the accept button, if he wishes to view the event, or switches to another channel.

Other capabilities MAAST offers include an electronic credit limit (which the operator determines himself), five in-band audio channels, a control network and seven-day programmability.

While production of the system is not scheduled to start until the beginning of 1984, Telease has already signed an agreement with NEC, which gives NEC exclusive rights to manufacture the system for the DBS market and to authorize licenses to manufacture the system to other DBS companies.

Negotiations with two other DBS firms and two SMATV companies are currently underway and Block expects these deals to be solidified shortly. He also noted that some telcos have expressed interest in the system. —*Constance Warren*

CED

Communications Engineering Digest

TECH II

CED's feature supplement and Product Profile

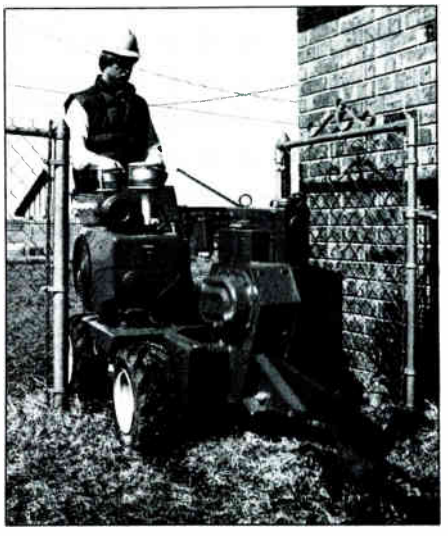
October 1983

Underground construction:

Percentages up; Restoration important

Product Profile:

Plows, trenchers, backhoes



Facing Heavy Underground

With higher percentages of underground plant in both new and existing builds, the industry must turn to other construction methods

Ask any cable operator if he plans to do further construction to either a new or existing system and he will answer "Yes." Ask him if the majority of that additional plant will be underground and he will again reply in the affirmative.

And while construction forecasts and declining profits signal less emphasis being placed on newbuild, the potential market for rebuilds and upgrades is substantial within the cable industry. Indeed, as many older systems seek to expand their present boundaries, the trend is to bury cable, especially in the more suburban communities where telephone poles and overhead lines are quickly becoming a thing of the past. It is true, unfortunately, that underground construction is more costly and time consuming than stringing aerial cable, but with new equipment designed to ease the underground building burden becoming available to the operator and contractor, the construction period is shortening.

Hesitation

In today's economy, operators are hesitant to invest not only in new plant, but also new equipment. However, there is a wide variety of plows and trenchers available on the market, and prices are competitive among them. Naturally, one factor an operator must weigh is the cost difference between purchasing underground equipment and hiring a contractor or turnkey operation to build or upgrade his system. The type of equipment the contractor or turnkey company uses is one consideration for the operator. Its reliability and capabilities in burying the cable and restoring the area after construction are two important points. Digging through a potential customer's yard, or in front of his driveway, must be done quickly and professionally, but most of all, diplomatically, to prevent any disturbance to that person's cherished property, or that which the customer may think is his own.

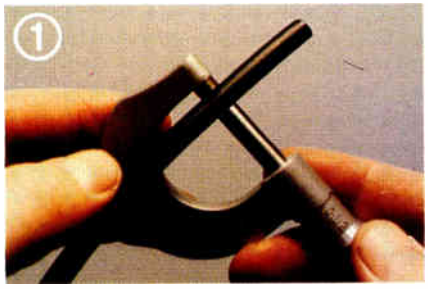
That's why an operator must consider the type of equipment that will bury cable as one of the most important factors in sustaining his business and growth. No customer or block of potential customers will support a cable system that leaves an unsightly trail of unflattened and unmanicured tracks through their neighborhood. Additionally, the placement of power supply boxes must be done judiciously, and more importantly, with an eye for the aesthetics. No resident wants to find a pedestal sitting in the middle of his front lawn or placed between his prized azaleas. Therefore, the cable operator must make sure that his construction crew consults with the homeowner to determine a location for the box that is both in line with the buried cable and placed in a spot that does not disrupt the composition of the resident's landscape.

Such procedures are mainly headaches to the cable operator, especially in newbuild situations when he is faced with a deadline, but they are important considerations when the operator is interested in building goodwill at the same time he is building his system.

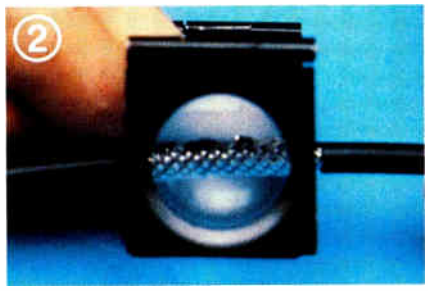
Underground construction offers less advantages than overhead, but ,as previously mentioned, tends to be the only option an operator has in many residential areas. Naturally, drops to homes are out of the question in such cases, leaving the installer to rely on piercing tools and the other smaller trenchers that build pathways to the customer's home. When underground is the only way the builder can go, he must be prepared to find many obstacles when burying cable. Some of those obstacles tend to be gas, water and sewage lines, plus telephone and electricity. If the operator can plan ahead and has both sufficient cable financing, he may want to prewire each home and place his cable in the same conduit and/or hole in which the telephone and/or electrical lines are placed. Placing cable near or next to water and gas lines is too hazardous and should be out of the question, if

Caveat Emptor*

Anybody who buys drop cable ought to try this little test.



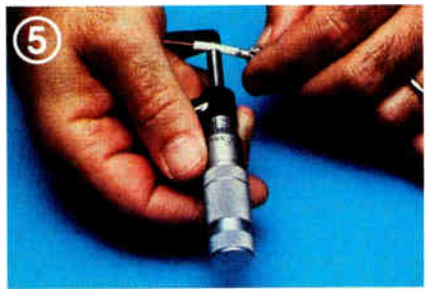
Measure the overall outside cable diameter with a micrometer. If it is not .242", connectors may not fit properly and performance might be affected.



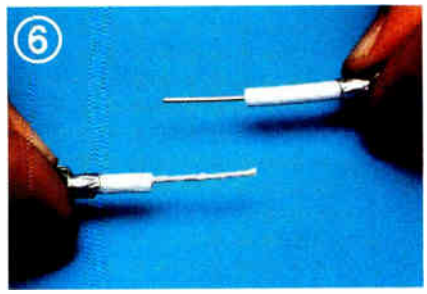
Carefully strip jacket off one inch of cable. If you ordered 67% braid, make sure 2/3 of the foil is covered by braid—not 1/2 or less.

Check the braid impression on the underside of the removed jacket. A deep impression indicates a jacket which is too tight. This may cause difficult "F" connector installation. An extremely shallow impression indicates a jacket which is too loose.

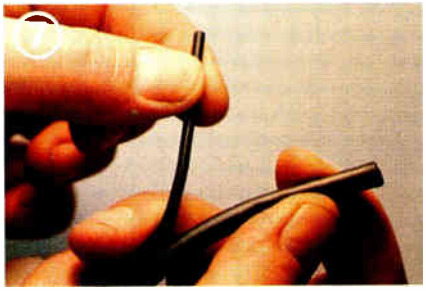
Now, strip off some jacket and braid, and expose the foil. If the aluminum/mylar shield peels off easily, it is not bonded. Duobond II® provides a strong bond to prevent the foil from pushing back during termination.



Measure the core in several places to make sure it is .143". On foil cables, measure over the foil to make sure it is .148". If out of tolerance, the connectors may not fit properly.

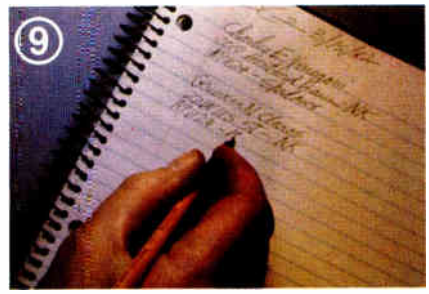


Remove a few inches of dielectric. If you find "fuzz" on the center conductor, intermittent contact may result. If the installer scrapes off the fuzz with a knife he runs the risk of damaging the copper cladding. Belden® cable stays smooth and clean every time.



On messengered cable, make sure the messenger separates without tearing into the jacket and exposing the shield.

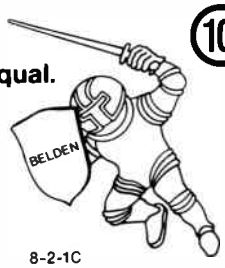
Is every reel of cable 100% sweep tested? All Belden® drop cable is (RG 59, 23 dB min.; RG 6, 26 dB min.). You don't have to accept anything less.



Count your callbacks due to cable or termination problems. The little extra that it costs to use Belden gives you a big extra in performance reliability and value.

Reader Service Number 30

There is no equal.



Don't believe everything you hear—or read. Even this. Test it for yourself. For more information, contact: Belden, Electronic Wire and Cable, P.O. Box 1980, Richmond, IN 47374. Phone: 317-983-5200.

*Let the buyer beware—especially when it comes to drop cable.

COOPER INDUSTRIES

BELDEN

8-2-1C

not illegal. In many new residential areas, however, it is becoming standard policy, and may even be written into the franchise, to prewire each new home and install hook-ups in the house in anticipation that the new owner or tenant will subscribe to cable. This is especially true in areas where townhouses are being built, where the cable can be laid more efficiently and splitters used to prewire each attached home, and in areas where residences are being built that are designated rental property. The high turnover rate in these cases almost necessitates prewiring, or at the least, leaving the cable within the home for the next resident, rather than having to remove it.

Another example of goodwill might be for the operator to approach either the owner/contractor of a new residential dwelling or private home and inquire about prewiring, if this isn't a part of the franchise. If the operator can sell the owner on his cable service, he can offer to bury the cable while the lawn has yet to be landscaped, thus saving time on his part. A salesman for the cable system may want to inspect where new houses are going up and then approach the owners about taking the service. Not only can a potential sale be made, but savings can be realized by the prewiring.

Running into rocks underground or other hard obstacles can also prove to be a time consuming and costly exercise in construction. However, there are several products presently on the market that are called underground piercing tools and are designed to efficiently cut through such obstructions. In addition, these tools easily go under sidewalks and other areas preventing the disruption and subsequent repair of such coverages. Some of those tools have also earned unusual names, but builders find they have proved their value.

Allied Steel & Tractor Products Inc. produces what the company calls a "Hole Hog" piercing tool that is used to make small diameter tunnels to lay cable and other lines. The tool is powered by a small compressor and travels under streets, walks, lawns and other surface obstructions.

In addition, other companies such as Elephant Industries Inc., which features the E-4, a lightweight, compact pipe and cable installer that can pull one-inch to four-inches of cable, and McLaughlin Manufacturing Co., which offers a boring system called "Mighty Mole," are among those that manufacture equipment designed for ease of underground digging. Mighty Mole can drill to any desire depth and is equipped with either a 6 Hp manual or electric-start engine. Other products available to the contractor include Pow-R Devices' PD-4 pipe pusher puller designed to operate in confined areas, and the appropriately named "Pneumagopher," which is a pneumatically-operator drill.

The companies that build plows and trenchers that are used primarily for backyard or residential digging include many of the big names in construction equipment. They are: Ditch Witch, J I Case, Turfco, Vermeer, Burkeen and other manufacturers such as American Trencher, Seaman-Parsons, Auburn and Midmark. John Deere Co., well-known within the farming industry as a manufacturer of large machinery, supplies many of the diesel plants used by these companies.

The contractor must also consider the kind of duct he plans to use to cover his buried cable. Duct or covers are especially important to protect the cable for no matter how deep the cable may be buried, and averages tend to run from six to eight inches, if the path is not clearly marked, chances are high a homeowner will accidentally cut into the cable while digging. And while most ducts cannot withstand the strength of a pick, most are durable enough to protect the cable and keep out moisture. Integral Corp.'s Coax-Cablecon cable-in-duct system is one such product available that is extruded over single, dual or multiple cable.

With the cable industry moving toward a higher percentage of underground construction, operators must make adjustments to their standard procedures of building—less reliance on aerial stringing. Indeed, more than 60 percent of newbuilds in large suburban and urban systems will require underground construction, some of it will be easier as operators are granted access permits to use ducts and conduits already in existence in tunnels, bypasses and subterranean passageways. Such access will lessen the time involved in digging.

But whether the percentage of underground build is 60 or six percent, an operator and/or contractor must be prepared to confront all the potential problems, procedures and emergencies that can appear when digging. Having the right equipment and taking all precautions can prevent accidents, time delays and unnecessary expenses. Training crew members to handle the machinery and emphasizing the need to replace and restore all property belonging to a wary resident must also play a prominent role for the operator. Together, these policies and preparations will make the task of underground construction go more smoothly.

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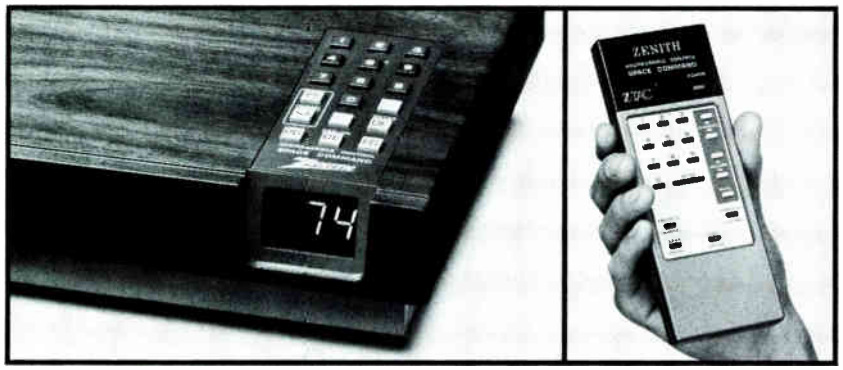

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Zenith Radio Corporation, 1000 N. Milwaukee Ave., Glenview, IL 60025, 312/391-8960

10/83/CED

ZENITH® CABLE PRODUCTS

Reader Service Number 32

Product Profile

Plows

Burkeen Manufacturing Co. has developed a vibratory plow, the DP-30, which can be used to lay cable under soil, roads and highways. The unit comes equipped with a plow blade to plow at greater depths and a cable reel carrier that facilitates the loading of the cable reel. All controls are mounted on the operator's side of the machine to eliminate the need for reaching across the machine. Other system components include a HATZ 30 HP two-cylinder diesel engine and a heavy-duty hydrostatic four-wheel drive system. A boring and trencher attachment, roll bar and seat, rolling cutter, and various sizes for reel carriers are optional.

Burkeen DP-30 vibratory plow

Height	53"	**Weight**	2700 lbs.
Machine plowing length	104"	**Engine**	Hatz Z790
Width	35"	**Number of cylinders**	2
Max. plowing depth	18-24" (depending on soil conditions)	**Hydraulic capacity**	5.4 gal.

Burkeen Manufacturing Co.
11200 High Point Cove
Olive Branch, Miss. 38654
(601) 895-4150

Ditch Witch describes its V252 vibratory plow as a "productive alternative to trenching." The V252, for use in installing cable, power service lines and plastic pipe, uses a four-weight unitrolly vibrator to increase force output. Other features include lever-operated power steering, a hydraulically-operated plow lift, ground drive powered by two hydraulic motors, controls marked for easy identification, self-lubricating and replaceable bushings located in the plow-linkage joints and a blot-on upper arm pivot joint for positioning. A hydraulic boring unit and blades for cover from 12 to 13 inches are optional.

The V252

Transport height	42"	**Max. depth soil cover**	13"	**Number of cylinders**	2
Max. length plowing	85"	**Max. speed**	2.84 mph	**Bore**	3.56"
Max. length transport	82"	**Plow turning radius**	102"	**Stroke**	3"
Plow width	36"	**Operating weight**	1370 lbs.	**Displacement**	60 in^3
Max. depth penetration	16"	**Engine**	Onan NHC-MS	**Hydraulic system capacity**	7.5 gal.

Ditch Witch
The Charles Machine Works Inc.
P.O. Box 66
Perry, Okla. 73077
(405) 336-4402

Seaman-Parsons offers the DP-60 saber plow for use in burying plastic pipe, cable or other conductors eight inches wider in diameter than the width of the unit itself. Reels up to seven-feet in diameter can be handled by the unit, which weighs approximately 4,000 lbs. Other features of the unit include an 80 HP John Deere diesel engine, two-speed transmission and infinitely variable hydrostatic drive, which permits transport speeds up to 6 mph. In addition, the plow can dig holes as deep as 30 inches at speeds up to 1.3 mph.

The DP-60 saber plow

Plowing depths	to 30"	**Plowing speed**	0-1.3 mph
Transport speed	0-6 mph	**Engine**	80 HP John Deere diesel
Number of speeds	2	**Weight**	max.: 4,000 lbs.

Seaman-Parsons Corp.
P.O. Box 25309
Milwaukee, Wis. 53225
(414) 781-8900

Trenchers

American Trencher offers a complete tractor trencher unit that is comprised of the Bradco 600C trencher, a 700 blade and a 9MD backhoe. Standard features are dual pivot convenience, which permits sidewalks to be undercut and the operator to dig at 90° without forcing him from the tractor seat; durable chains; safety features including an R.O.P.S. seatbelt and safety trench surfaces; trencher and backhoe transport locks; and tie downs. A sideboom, offset mounting, rock and frost teeth, pengo teeth, mud teeth and a dual chain are optional.

Bradco 600C trencher

Trench depth @ 90° angle	4'10" (1.45m) 6'4" (1.93m) 7'10" (2.39m)	**Transport width w/ blade**	7'
Trench depth @ 60° angle	3'10" (1.15m) 5'2" (1.57m) 6'5" (1.96m)	**Transport height** **6' boom** **4' boom**	 12'10" 10'
Trench width	6" (152.4mm)—18" (457.2mm), (4' & 5' only)	**Operating height**	8'4"
Boom travel **up** **down**	 69° 106°	**Tread width**	5'1"
Max. trenching angle	90°	**Angle of departure**	45°

Length transport	19' (6' boom) 16'6" (4' boom)	**Angle of approach**	24°

American Trencher Inc.
P.O. Box 266
Delhi, Iowa 52223
(319) 922-2981

Auburn Consolidated Industries Inc. manufactures a variety of trenchers for use in cable installation. A utility trencher for JD301 and JD401 John Deere tractors and an "XL" utility trencher for HI International 2400-2500 tractors are among those units currently available for cable applications. The utility trencher features 16 speeds for trenching, backfilling, loading or transporting; a hydraulic boom control; auxiliary transmission; a heavy duty digging unit; and digging chains and a bit forged from alloy steel. The "XL" utility trencher offers eight forward speeds from which to choose and four reverse speeds. Other system components include a heavy duty digging unit, a hydraulic boom control unit and a power take-off angle drive. A crumber and grader that cleans and contours the bottom of the trench while also maintaining grade level when tiling is available with both units.

	The utility trencher	**The "XL" utility trencher**
Trenching width	6-14"	6-14"
Trenching depth	6'	6'
Number of speeds	16	8 forward, 4 reverse
Digging bits	patented molybdenum alloy steel, heat treated, hard surfaced and Pent-A-Bits available	
Trench speed	controlled through tractor transmission, taking advantage of all speeds	3'/per min. in L.R. first gear to 1,500'/ per hr. in H.R. third gear
Depth control	regulated by two-way hydraulic control valve	
Weight	approx. 1,750 lbs.	approx. 1,750 lbs.
Pent-A-Bits	available in 5", 8", 11" and 14" widths	

Auburn Consolidated Industries Inc.
2100 South J St.
Auburn, Neb. 68305
(402) 274-4911

J I Case markets a variety of trenchers, including the DH4, DH5 and 30+4 trencher. These three trenchers can be used in a myraid of cable laying applications and can dig to different depths and widths, depending on what's needed. The DH5 digs trenches from 6 to 16 inches wide and from 36-72 inches deep. The DH4 trenches to a maximum width of 16 inches and depth of 72 inches, while the 30+4 trencher digs from 4-16 inches wide and from 24-60 inches deep. Each of these trenchers features different standard components and capabilities. Optional equipment is available with all models.

	DH4	**DH5**	**30+4 trencher**
Engine	4DQ50	Case 207	Wisconsin VH4D
Power	50 HP (gross 60 rated)	HP (gross rated)	30 HP
Travel speed	transport-7.17 mph working-2.92 mph	0-3.2 mph (forward and reverse, infinitely variable)	transport: infinitely variable to 4.8 mph working: infinitely variable to 3.4 mph
Weight	3,500 lbs.	4,800 lbs.	N/A
Trenching width	max. 16"	max. 16"	max. 16"
Trenching depth	max. 72"	max. 72"	max. 60"
Transport height (w/backhoe)	84.6-96.7" (depending on choice of backhoe)	83.1-96.7" (depending on choice of backhoe)	81"
Digging depth	11.8-136"	74.3-97.3"	77.7" max.
Loading height	64.3-71.6"	62.9-71.6"	61" max.
Digging reach	11.8-136"	N/A	113.5"

J I Case
Construction Equipment Division
700 State St.
Racine, Wis. 53404
(414) 636-6011

Midmark Corp. offers at least three trenchers for the cable industry—two are propelled by the operator and the other is self-propelled. The two non-riding trenchers are the "Powermatic" 140 and 108 trenchers. Both units feature hydrostatic power and provide a variable digging chain speed to accommodate diverse soil conditions. The 108, however, digs to a maximum depth of 30 inches, while the Powermatic 140 can trench to 36 inches. Midmark's 321 self-propelled trencher is available in a variety of models, including 18, 20, 30 and 37 HP four-wheel versions. Similar to the "Powermatic" and 108, the 321 is powered by hydrostatic power. A boom, power digging chain and backfill blade are standard components, while boring, plowing, backfilling and backhoeing tools are optional.

	Powermatic		
	108	**140**	**321**
Engine	Wisconsin Robin EY27W 7.5 HP	Wisconsin S14D 14 HP	Wisconsin 30 HP
Fuel capacity	1.45 gal.	2.75 gal.	10.6 gal.

Working speed	road transport: variable to .5 mph trenching: varies	road transport: infinitely variable to 2.8 mph; trenching: varies	road transport: infinitely variable to 5 mph; trenching: varies dozing: variable to 5 mph
Turning radius	N/A	4½' (1.4m)	9½' (2.9m)
Trench sizes			
width	2½-8"	4-8"	6-12"
depth	30-34"	24-36"	30-48"
Weight	800 lbs.	1290 lbs.	3250 lbs.

Midmark Corp.
Versailles, Ohio 45380
(800) 643-6275

Seaman-Parsons manufactures a variety of trenchers for cable applications, including the T80, T120 and T750 models.

Both Parsons' T80 and T120 trenchers feature a hydraulic boom lift control to raise and lower the digging boom and infinite speed control. In both units, travel speed is controlled by regulating the plow to the hydraulic motor for forward and reverse drive. The T80, however, features a 7.5 HP engine, while the T120 uses a 11.2 HP engine. Digging parameters for both trenchers are 36 inches deep and six inches wide.

Parsons T750 trencher uses heavy-duty right angle drive to permit higher trenching speeds. Other features of the trencher include a 75 HP John Deere diesel engine, four-wheel hydrostatic drive, a combination of articulation and automatic steering to improve maneuverability and two-speed transmission to provide digging speeds of 2.6 mph and transport speeds up to 12.5 mph. The trencher can also dig to depths of 108 inches and widths of 18 inches.

	T80	T120	T750
Digging depth	24-30"	24", 30" or 36"	108"
Digging width	4-6"	4-6"	6-18"
Engine	Wisconsin Robin Air	Wisconsin Robin Air	John Deere 4219
Fuel capacity	1.45 gal.	1.6 gal.	16 gal.
Drive, type	fully hydraulic ground drive	fully hydraulic ground drive	four-wheel hydrostatic
Working speed	0-25 fpm	0-25 fpm	0-2.6 mph

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Reader Service Number 35

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Reader Service Number 52

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Transport speed	0-68 fpm	0-68 fpm	0-9.3 mph
Width	32"	32"	76", without blade & with max. tires
Height	38"	44"	transport: 9'9" loading: 8'0"
Swing arc	N/A	N/A	180

Seaman-Parsons
P.O. Box 25331
Milwaukee, Wisc. 53225
(414) 781-8900

Turfco Manufacturing Inc. has designed what it refers to as a "trenchless trencher." This unit, better known as the "pipe piper," can be operated by one man to bury flexible or semi-flexible pipe, cable or wire. Through an oscillating action, the unit can cut cleanly through turf, leaving only a "slightly" noticeable slit in the turf after burying is completed. The pipe piper is available in three models to accommodate different ground conditions and depth requirements and is equipped with a standard blade that reaches to depths from 5 to 12 inches. Longer blades and tunneling points for pulling pipe, cable and wire in 7/8-2 1/4 inches are also available.

The Pipe Piper

Model	100-A & 100-B	140-A & 140-B	180-A & 180-B
Engine	10 HP, 4-cycle Briggs & Stratton	14 HP, 4-cycle Kohler	20 HP, 2 cylinder Kohler
Max. speed	Model 100-A: 50 ft./min. Model 100-B: 100 ft./min.	Model 140-A: 75 ft./min. Model 140-B: 150 ft./min.	Model 180-A: 50 ft./min. Model 180-B: 150 ft./min.
Gears	one forward and neutral	two forward, neutral and power reverse	two forward, neutral and power reverse
Net weight	565 lbs.	916 lbs.	1275 lbs.
Dimensions	60"l x 34" w x 41" h	70"l x 35" w x 47" h	78"l x 36" w x 50" h
Controls	main clutch lever (belt tightener clutch), right and left traction control levers, throttle, off/on switch, gear shift lever, blade depth adjustment lever, hydraulic on models 180-A and 180-B		
Gear case	heat treated bronze worm gear and steel gears running in oil		
Lubrication	oil bath in gear case, grease fittings in eccentric bearings, oscillating arms, idler pulley and other points of friction		

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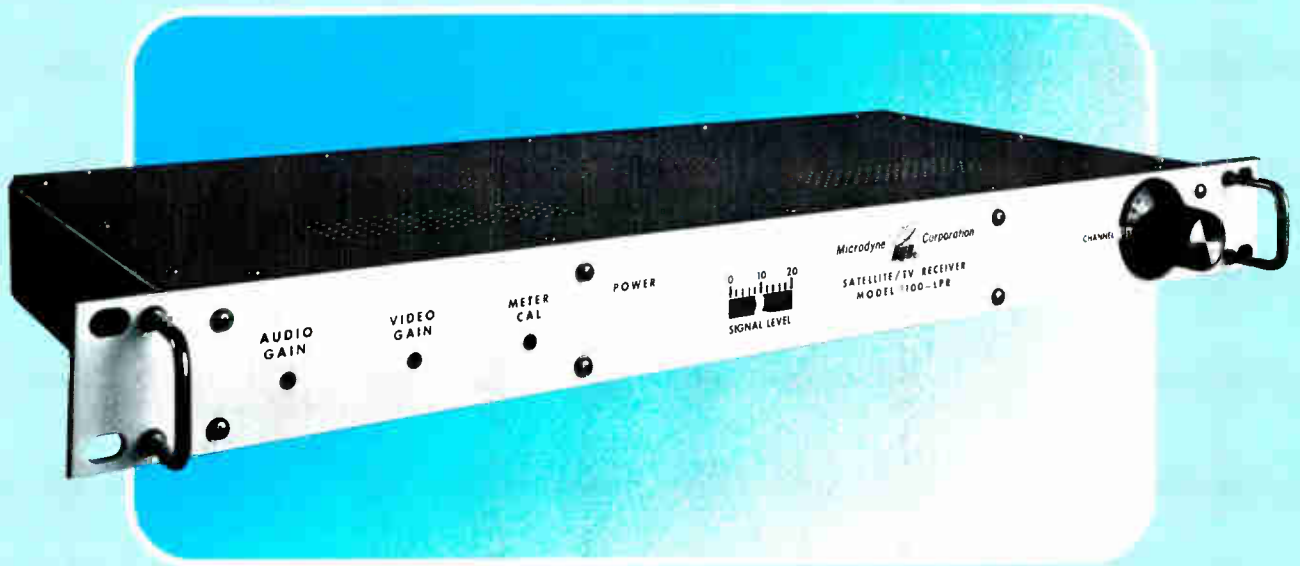

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P.O. Box 7213 • Ocala, FL 32672 • Phone: (904) 687-4633 • TWX: 810-858-0307

Reader Service Number 38

Drive	V-belt from engine, worm gear drive to four, inline front wheels

Turfco Mfg. Inc.
3456 Washington Ave., North
Minneapolis, Minn. 55412-2688
(612) 588-0741

Vermeer Manufacturing Co. offers the cable constructer many trenchers from which to choose. Due to space limitations, only three will be covered here. The 300B features 30 horsepower, semi-cleated 10-inch tracks, positive chain alignment, alloy cutters and a split digging chain drive sprocket. It is designed to trench next to buildings and other obstructions. The V-440, on the other hand offers applications for a wide variety of underground functions, or so the company claims. Backhoe, reel carrier and dozer blade attachments are available with the unit. The Vermeer 600D trencher is for heavy duty jobs. It's equipped with a seven-foot diameter wheel and 90 carbide-tipped rotary cutters and can penetrate hard surfaces such as most rock and solid reinforced concrete.

	T-300B	V-440	T-600D
Engine	Wisconsin VH4D	Ford 98	GM 4-53
Length	160"	93"	204"
Width	47"	71½"	95"
Height	77" (operation)	91½"	82" (operation)
Turning radius	139" (boom horizontal) 106" (boom up)	tractor only-177", w/backfill blade-192"	N/A
Fuel tank capacity	9.9 gal.	16.5 gal.	30 gal.
Trench depths, max.	60"	60"	72"
Trench width, max.	6-16", depending on chain	12"	24"
Digging chain side	1957	2481M	1713K
Max. horse power	29	44	123

Vermeer Manufacturing Co.
P.O. Box 200
Pella, Iowa 50219
(515) 628-3141

Backhoes

American Trencher manufactures a variety of backhoes, of which at least two can be used for cable laying purposes. The "utility special" is for those jobs which require digging to depths of eight feet or more. This unit can be mounted on a ¾-ton truck or on heavier vehicles and is available with an optional hydraulic accessory circuit that is equipped with a built-in pressure compensated variable volume flow control device and a direct reading flow meter.

Another American Trencher backhoe specifically designed for utility digging purposes is the 31 TLB, nicknamed the "tough little backhoe." This unit is for those applications where deep digging is not required but mobility is. This backhoe features a nine-foot ICED digging depth backhoe, a mechanical self-leveling loader and hard nose radiator protection.

	Utility special 8 foot	Utility special 12 foot	31 TLB
Digging depth	8'	12'2"	108"
Swing arc	180°	180°	180°
Reach from center of swing post	11'9"	16'6"	142"
Digging force			
bucket cyl.	4999#	4560#	6438#
dipper cyl.	2860#	1835#	4265#
Transport height	6'8"	8'11"	80"
Loading height	6'8"	11'6"	70"
Bucket rotation	180°	180°	180°
Swing arc	180°	180°	180°

American Trencher Inc.
P.O. Box 266
Delhi, Iowa 52223
(319) 922-2981

Line Ward Corp.'s L-1 cable line layer is a one-man self-propelled four-wheel drive machine that buries cable, telephone wire or sprinkling pipe at depths of 6 inches and 13 inches, depending on soil conditions. A choice of high, low and reverse speeds is provided along with a "tracks" system that matches the machine's speed to ground conditions to achieve a compensating variable ground speed. According to the company, the unit was designed to slice the ground, lay the cable and backfill and compact the slot in one trenchless operation while simultaneously keeping vibration away from the operator. Feed, pull and ripper blades are available.

L-1 cable line layer		
Transport height	44"	**Engine** 16 HP Kohler gasoline
Length	50"	**Max. speed transportation** 140 fpm
Width	24½"	**Burying speed** 58-88 fpm
Max. depth penetration	13"	**Weight** 800 lbs.

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

CED

2. Type of trunk cables.
3. Distance in feet between all trunk amplifiers.
4. Type of passives in trunk line, i.e., DC-8, DC-16, two-way, three-way etc.
5. Power supply locations and voltage rating.
6. Alternate routes which may reduce cascade lengths.
7. Potential trunk routes through growth areas.

The system map and amplifier schematic will define the architectural structure of the system. This verifies the location of physical facilities and helps to extrapolate cascade lengths and resultant system performance.

Trunk analysis

The physical location of the signal reception facilities and the trunk backbone of the system are integral to the performance of the upgraded plant. The current locations of these facilities may *not* be suitable for an upgrade. The headend hubs or earth stations may require relocation for optimal performance of the system, or additional hubs may be needed to provide acceptable cascade lengths for an upgrade.

Generally, the most effective upgrade will use existing trunk amplifier locations with an adjustment of trunk levels to accommodate additional channel loading and increased frequency bandwidth. This can typically be accomplished by increasing the amplifier output levels which will overcome the increased attenuation of cable at higher frequencies.

By installing amplifiers with a greater output capability, such as Century III's feed-forward amplifier, improved chips or distributed gain chips, output capability can be increased with reduced third order distortion contribution and improved S/N performance. Another upgrade approach increases input levels by reducing attenuation between amplifiers by replacing existing cable with lower loss cable.

Both approaches are superior to the respacing of trunk amplifiers which typically increases the number of actives in the system.

Feeder analysis: "drop-in vs. respacing"

The feeder upgrade (from a preliminary viewpoint) can best be evaluated by determining the total number of line extenders per mile. Older systems frequently were designed and built as turnkeys. As a result, the manufacturer's design typically used low LX output levels of 35-38 dB, which typically resulted in four to six LX's per mile. The obvious drawback to an amplifier "drop-in" would be the large number of line extenders and the associated labor cost. The not so obvious drawback is new line extenders often draw more current and require additional power supplies.

The alternative to a line extender "drop-in" is a line extender respacing. This approach increases output levels to (typically) 48-50 dB out, significantly reducing the total number of actives in the cable system. This will decrease overall power consumption, improve system reliability and lower maintenance and operating expenses by reducing the total number of actives in the system. (Typically, distribution actives can be reduced to two or three per mile.)

Additional considerations

An increase in line extender output levels may require the replacement of subscriber taps to achieve proper signal levels. If the existing taps have interchangeable face plates, it's a simple matter to replace them. However, it may be necessary to replace non-sleeved connectors with integral mandral radiation sleeves to meet FCC radiation limits. If this is required, the simultaneous installation of new taps will complement a line

extender respacing and decrease the total number of actives in the system.

The savings in line extenders and labor minus the total cost of replacing taps and connectors will result in an adjusted cost for upgrading a feeder system.

Depending on total LX's and taps per mile, the capital cost for respacing LX's could be less than an amplifier "drop-in" using existing output levels. Coupled with reduced power consumption, improved reliability and reduced maintenance, reducing actives in a cable system can produce substantial savings.

For example, reducing a system's actives by 30% and compounding savings in power consumption over a 15-year period—assuming a 10% increase in power cost annually—could result in a $150,000 savings in a 500-mile system. Reduced maintenance and improved reliability make the feeder respacing an even more attractive alternative. Engineers often assume an amplifier "drop-in" is the fastest, simplest and most economical approach to an upgrade. However, the analysis just outlined suggests that each system should be evaluated on its own merits and a respacing of line extenders should not be eliminated prematurely.

Preliminary evaluation

The information provided so far is sufficient to make a preliminary evaluation of the system architecture and its ability to meet the operator's upgrade objective. This evaluation should include:

1. Analysis of current headend and earth station sites for compatibility.
2. Comparison of various distribution plans—AML, VFM and super trunks (as required).
3. Calculations of total cascade in dB's using various cables as required to provide optimal cascadibility at the design frequency.
4. Selection of the best amplifier for the system's needs.
5. Selection of a drop-in approach or a cable replacement.
6. Calculation of trunk actives and/or cable costs required to upgrade the system.
7. Calculation of feeder, active, passive cable costs for the distribution upgrade.
8. Extrapolation of system performance specifications.

Upgrade alternative—capital costs

A number of alternatives exist in determining a technically feasible upgrade method. While several methods may produce similar technical performance, it is unlikely that costs will be identical. Now that the engineer has adequate information to select an upgrade from a technical standpoint, he should compare the various approaches on a capital cost basis.

Trunk switch evaluation

Evaluation of alternatives for upgrading the trunk system should include an amplifier drop-in, (determine amplifier type to be used), a trunk cable overlash with a lower loss cable and trunk respacing.

If the exisitng trunk cable is capable of meeting bandwidth requirements, an amplifier drop-in should be considered. Utilizing improved performance amplifiers, a drop-in can be completed quicker and at a lower cost than a trunk cable overlash. Although trunk respacing is an option, it is usually applied only to a transportation run. The logistical and feeder-related problems in populated areas prohibit this approach where trunk and feeder are jointly lashed.

Feeder system evaluation

Once a preliminary decision has been made to upgrade the trunk system, the feeder system can be evaluated on a capital cost basis. Again, a cost comparison of a drop-in and line extender respacing should be completed. This should include a capital comparison plus a long-term comparison reflecting savings in reduced power consumption and maintenance. This evaluation should be considered preliminary and should only be used to select the most viable technical and economic aproach for the upgrade. Remember, the results of a preliminary evaluation may change after an in-depth analysis of the system and its individual components is completed.

Component evaluation

It is absolutely essential that component evaluation be accurate and documented. No two upgrades are identical, so each segment of the system, i.e., strand, hardware, cable passives, taps and electronics, must be evaluated separately, yet as a whole with an end objective in sight. Component testing is not to be confused with system testing. The purpose in testing individual items is to ensure valid testing techniques in a laboratory situation since testing oversights can adversely affect the outcome of an evaluation. This does not diminish the importance of system testing; the two need to go hand in hand. However, if component testing conclusively indicates unacceptable performance, the need for system testing would be minimal.

The component evaluation should proceed as follows:

Strand and hardware

1. Size and type.
2. Corrosion, pits or other structural damage.
3. Excessive stretching caused by adverse weather conditions.
4. Tensile strength evaluation of *typical* segment of strand. (These tests can be completed by mechanical testing laboratories and should be done if any doubt exists as to the structural integrity of the strand or hardware.)
5. Additional loading capability of strand.
6. Overlashing with telephone company.
7. Ground clamps and lashing wire clamps in place and in good condition.
8. Complete bonding and grounding which meets current bonding and grounding requirements.
9. System properly guyed; guys and anchors in good condition and up to utility specifications.

Cable trunk feeder (mechanical integrity)

1. Determine age, type, size and mechanical structure of the cable. (An original specification sheet is generally helpful for a comparison to actual tests.)
2. Physical condition of the cable, i.e., pitted, corroded, cracked or sheath damage.
3. Seven- or eight-foot segments of cable including an expansion loop from representative sections of the plant removed and sent to a testing laboratory. Cable manufacturers typically have the capability and may perform the following tests on request:
   a) Temperature cycling: total number of expansion and contraction cycles before cable failure. This number represents the number of months or years the cable should last before mechanical failure.
   b) Water migration: Has water gotten into the cable? If so, how far?
   c) Dialectric to sheath adhesion: Is the dialectric well bounded to the sheath?
   d) Dialectric to center conductor adhesion: Is the dialectric well bounded to the center conductor?
   e) Ovality: What is the tolerance of the cable as compared to perfectly circular cable and are connectors easily available and within the tolerance range of the cable?

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Drop cable

Frequently the replacement of drops due to poor shielding efficiency, attenuation or aging is overlooked. However, the replacement of drops can contribute significantly to the cost of an upgrade. Accurate testing can provide valuable information about the percentage of drops that will require replacement and the resultant cost. The following tests should be done on a random sample of drops of 100 feet or more.

1. Messengered on non messengered: If non messengered, how is the cable supported? Is there sheath damage?
2. Cable shielding efficiency.
3. Cable attenuation.
4. Cable useable bandwidth.
5. Is cable braid or foil?

Amplifiers (truck & distribution)

1. Manufacturer and model;
2. Are amplifiers single-ended or push-pull?
3. Amplifier specifications including gain, minimum input, output capability, noise figure, second order and third order specification.
4. Power consumption.
5. Availability of push-pull upgrade kits.
6. Amplifier physical condition, i.e., corrosion, RFI shielding, gasketing, water tightness and mechanical soundness.
7. System's original design specifications.
8. Do design specifications match levels as physically measured in plant?

Passives and taps

A random sample of taps and passives should be bench tested to determine performance parameters. *It is essential that these items be removed from the field.* Do not test unused inventory since aging and other elements can affect the electrical performance of the device being tested. Tap testing should be done with tap ports terminate and unterminated since many older taps will respond differently. Tests should include the following:

1. Attentuation.
2. Return loss.
3. Response.
4. Directivety.
5. Isolation.
6. Ability to accept connectors. Are connectors integral to the tap or device?
7. Is the device two-way capable?
8. Can the device accept negative traps without modification?
9. If original powering is at 30, how will the tap react if voltage is increased 60 volts? Do additional failures occur or does hum increase? If so, how much?
10. What is the overall mechanical condition of the tap? Is it reusable?

Power supplies

1. Type of power supply.
2. Current and voltage rating of power supply.
3. Can the power supply be switched from 30 to 60 volts by modification?
4. Power supply efficiency rating.
5. What is the average loading per supply?
6. Power supply physical integrity.

When the foregoing information has been gathered and testing is complete, it can be determined which components (if any) may be reusable in the upgraded system. If the strand and hardware are mechanically deficient, it is of little use to salvage cable, connectors and other items which have low salvage value.

Under these circumstances, system testing would provide little additional information on the upgrade and a total rebuild would be the obvious course of action.

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Reader Service Number 42

System testing
Cable (trunk & feeder) electrical

System testing has purposefully been segmented from component testing to allow the engineer to gather information without being physically on site. Once component testing and information gathering are complete, the engineer can place emphasis on segments of system testing according to his preliminary evaluation.

To maintain quality and accuracy, all system testing should be completed by a qualified technician using the same calibrated test equipment throughout the information gathering process. The use of different test equipment and technicians may provide erroneous information which can inappropriately affect the engineer's decision. The following information now should be gathered and collated:

1. Input and output levels at all trunk amplifiers with flat loss and type and size of cable specificed in cable spacings.
2. Input and output levels on a random sample of LX's to determine average inputs.
3. Cable attenuation. Does it follow manufacturer's spec sheet?
4. DC loop resistance of the cable.
5. Does the cable follow an attenuation curve which meets manufacturer's specifications or follows B1/B2?
6. Overall cable bandwidth. Is it linear?
7. Sweep response of the cable. Does the cable sweep with acceptable results?
8. Cable return loss.
9. Are there irregularities that may cause a response problem if the bandwidth of the system is extended?
10. Are there any other irregularities or peculiarities that might affect the operation of the system such as nonlinear temperature coefficient?

System ingress testing

Integral to the in-depth testing of the physical plant is a thorough evaluation of ingress and egress in the system. The results of the ingress/egress testing can identify system components that will require replacement.

The use of 108-136 MHz and 225-400 MHz is regulated by the FCC in conjunction with the FAA. Unauthorized use not in compliance with federal regulations can result in significant fines, loss of channel assignments and possible imprisonment for the operator. Before any channels in these bandwidths are activated, a thorough analysis of system radiation should be completed.

This can be accomplished by tracking ingress/egress related service calls. *This tracking program should be set up well in advance of the decision-making process.* This can provide detailed cost and performance data if proper tracking mechanisms are instituted from the inception of the construction project.

The program can be easily performed by service technicians. Through the course of normal service calls, the technicians should make Field Strength Meter (FSM) readings on certain channels as defined by the project engineer. Channels tested should include two or three FM stations *which are not carried on the cable system* and any VHF channels vacated due to direct pick-up problems.

If the system segment is ingress free, no reading will be measureable on the channels in question. If a reading in excess of a signal threshold, determined by the engineer, is measured at the subscriber terminal, an ingress problem exists.

The technician can then take a reading at the tap and determine if the problem is a drop- or plant-related problem. In either case, the problem should be localized and corrected. Drops replaced can be viewed as a percentage of drops tested. Extrapolation then provides an estimate for the total number of drops which will have to be replaced in the system.

As plant problems are corrected, valuable insight can be gained into areas that required special attention such as tap or connector failures. If is imperative that the program be in operation long enough to provide a sufficient sample to provide valid statistical data on ingress in the system. If the sample is valid, the derived data can and should be used in the upgrade analysis.

Test phase

By now a significant amount of information has been gathered reflecting economic analysis and in-depth component and system testing, which will allow the engineer to determine what components, if any, will be reuseable. Once this detailed information is collected and analyzed, the design of an upgraded system is not unike that of a new system.

The job of the engineer is to use existing equipment which is functional and combine it with new equipment to provide technical performance that meets the upgrade objective. This can best be accomplished by selecting a test phase to put into practice the engineer's hypotheses.

Decision making

Clearly, a test phase is crucial to the success of any upgrade. The geographic area selected should be representative of the entire plant. Occasionally, separate approaches may be necessary in different segments of the plant. Once a valid test phase has been selected an engineer should do the following:

1. A sample design should be completed with a calculated amplifier input level and end-of-line reading.
2. A well-defined tracking mechanism for cost and performance must be instituted.
3. Construction should begin.
4. The plant should be swept and balanced with sweep photographs at all actives and end of lines. FSM readings can be taken as required to localize problem areas such as defective passives, cable and connectors. Percentages and qualities should be determined for all items replaced which were not originally recognized.

Proper tracking of the test phase will provide information which will determine the feasibility of the approach.

Conclusion

After all defective components have been replaced, the actual cost including material, labor and overhead can be calculated and converted to a per mile cost. However, this number is not yet definitive. Calculated levels should be compared to actual system levels. If a substantial difference exists, the design criteria should be reevaluated. Discrepancies may be caused by cable or passives which exhibit a consistently lower attenuation than used in the design. Changing these parameters can affect the cost per mile of the upgrade.

Perhaps the single most important factor in the success of an upgrade is the ability of the project engineer to evaluate and track the cost and technical performance of the system on a continuing basis. It is entirely likely that the results in different phases may vary. If they do, the engineer must be flexible enough to reevaluate each segment individually and pursue whatever approach is most feasible.

In Sept. 1982, after a 10-year stint at American Television and Communications Corp., Michael Morris left ATC to form his own company, known as MorCom Inc. The Denver-based firm provides a variety of CATV services including: upgrade and rebuild system analysis, sweep and balance and equipment repair.

During his ten years at ATC, Morris served in numerous capacities including regional engineer, franchising engineer and as corporate project engineer with responsibility for ATC's Eastern cable systems.

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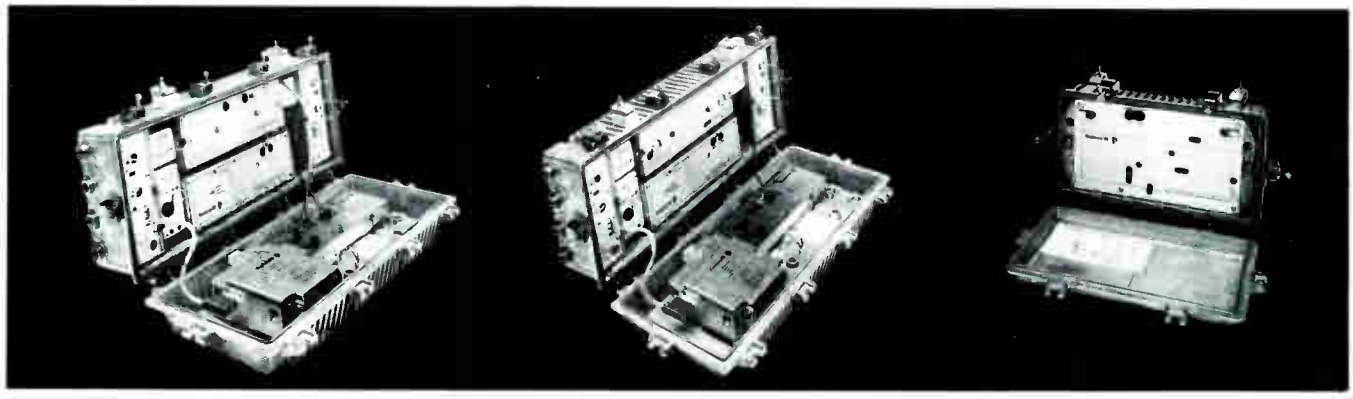

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	450 MHz 60 Ch. Loading	Century III Actual System Operating Levels			Other Equipment
	Trunk Spacing	22dB	26dB	30dB	
Trunk	Output Level	+33dBmV	+36dBmV	+40dBmV	
	Composite Triple Beat	−102dB	−96dB	−88dB	
	Cross Modulation	−102dB	−96dB	−88dB	
Bridger	Output Level	+47dBmV	+49dBmV	+49dBmV	
	Composite Triple Beat	−74dB	−70dB	−70dB	
	Cross Modulation	−74dB	−70dB	−70dB	
Line Extender	Output Level	+47dBmV	+49dBmV	+49dBmV	
	Composite Triple Beat	−74dB	−70dB	−70dB	
	Cross Modulation	−74dB	−70dB	−70dB	

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Century III

CENTURY III ELECTRONICS INTERNATIONAL, INC.

Reader Service Number 43

specific operating details have not yet been worked out. ICS says it hasn't decided whether individual services will be bundled together or how customers will be billed for Transtext offerings. Details about who will make the gray box or how much it will cost are also undetermined.

At the technological heart of the Transtext system is a "superswitch gateway," which is a revised version of the Local Area Data Transport (LADT) packet-switched network being used in the south Florida Viewtron videotex system. In addition, a "system manager" software-intensive package enhances the system and transmits instructions through telephone lines to the cable TV headend, which feeds data and video to the at-home gray box. ICS says it has taken all seven levels of standard communications protocols and modified them so that they can function together to create the Transtext package of services.

ICS defines its role as a "facilitator," coordinating the specific services, which include banking, shopping and entertainment being offered by individual vendors. Additionally, the system is powerful enough to encompass home security and home automation as well as information retrieval and other teleservices. As such, it could become a powerful centerpiece in the long-awaited "home of the future," replete with its work-at-home electronics center. The partner companies all apparently have something to gain from the development of such a product—be it order processing and system management of teleshopping and telebanking services or the engineering of homes and business structures that are prebuilt with the gray box capacity.

Clearly ICS is not the only organization looking for the magic formula for hybrid interactive services. The attractiveness of such facilities is certain to increase—especially in the coming era of higher priced and time-metered telephone service. For example, a recent test of hybrid two-way service found that during a 20-minute interactive session, less than 30 seconds was actually spent in communications from the user terminal to the headend. With a program downloaded into the home terminal and off-line user processing, it only takes a few moments to feed information back upstream. Certainly in a video-on-demand system, where there could be intense contention for bandwidth among hundreds or thousands of subscribers, it will be desirable to keep them off line as much as possible. That's why the powerful consortium behind ICS is so fascinating. The identities of the few partners who are known—and the mystery of the other players—suggest that maybe they *have* found some answers to the hybrid questions that so many have been asking during the past few years.

Notes

Enhancing games

The Games Network, a cable TV videogame channel that will debut later this year, is already considering additional services that could offer information, education—and possibly a system to drive a home videodisc player for full-video displays. On two-way cable TV systems, the service could also handle electronic mail and other fully interactive services.

The Games Network tested its service earlier this year on a Group W Cable system in Fullerton, Calif., using a less sophisticated terminal than the one it now plans to offer. Its new device will allow The Games Network to offer adventure games, strategy, board and card games in addition to the familiar arcade-type videogames.

The Games Network will use a bit-map graphic system to obtain high-resolution graphics. The software-driven system will allow the service to offer any computer programs that can be downloaded into the proprietary terminal that the company has developed, called "The Window."

Tariff troubles

A new telephone modem tariff in Oklahoma could impede home online information services. It also offers a potential clue to what the new local telephone companies plan to do to carve new revenue sources out of the communications boom. Southwestern Bell has created a $33 per month tariff for modem connections—an arrangement that hits directly at home users of services such as The Source and CompuServe, who now are faced with monthly telephone bills of $50 plus long distance charges. The phone company says it has the right to assess the "information terminal rate" under its business communications fee structure.

CompuServe has protested the tariff, charging that it discriminates against residential phone customers—starting with the company's 400 Oklahoma customers.

Public TV's data-teletext interest

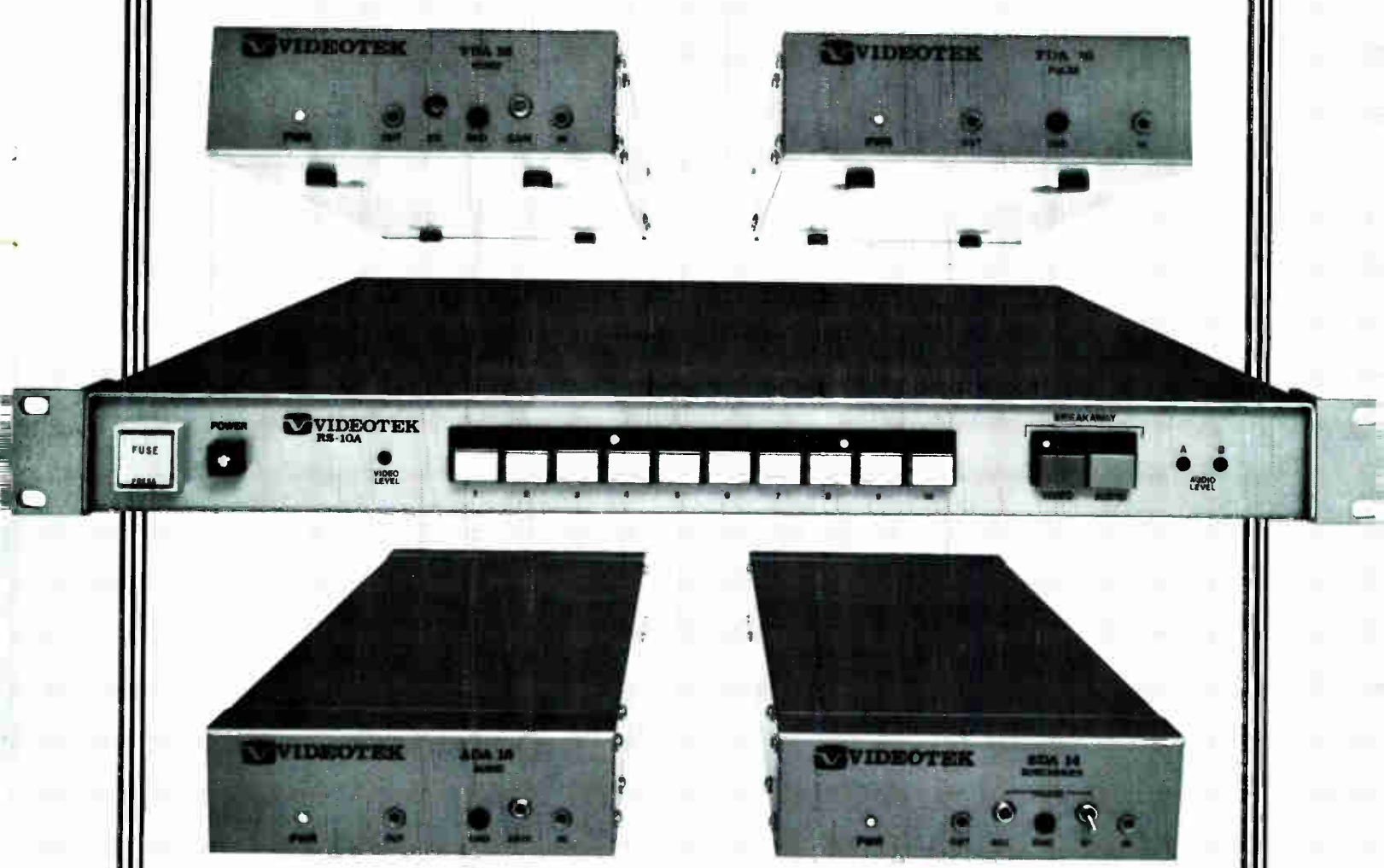
Satellite Network Delivery Corp., which plans to send business-oriented data via the vertical blanking interval of a satellite-public TV station system, is accelerating its timetable again, with an eye toward a 1984 start-up. SND's Business Teletext Network involves public TV stations in major cities, offering a revenue sharing arrangement that eventually will generate profits for the financially-strapped public TV stations. WNET-TV in New York City was the first to join SND's team and is helping to recruit other public TV stations. Several have already signed up, but others are balking at SND's demand for long-term exclusive access to half of each station's VBI lines that are allocated to teletext.

The SND effort comes at the same time as the Public Broadcasting Service steps up its efforts to find revenue-producing ventures for the VBI of its network feed. PBS is advising local public TV stations that it is "too early to make any long term commitments" for teletext. Meanwhile PBS, in cooperation with public TV stations in three cities, is working on a business data delivery system, coordinated by Merrill Lynch.

Politically, PBS officials are sensitive to proposals such as the one by SND. If SND or any other operator successfully recruits major market public TV affiliates, it could stymie future PBS plans to develop any national teletext or data service; that is, by locking up local VBI lines, an outside vendor could lock out a PBS network data service. Alternatively, PBS might have to negotiate with SND to gain use of the public TV station VBI lines. In any case, the process could destroy the unity of the network—and in the process, offer a prototype for what might happen in commercial broadcasting if local stations decide to use their VBIs for their own purposes, rather than relying on what the network plans to feed them.

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. CED

PROGRESS



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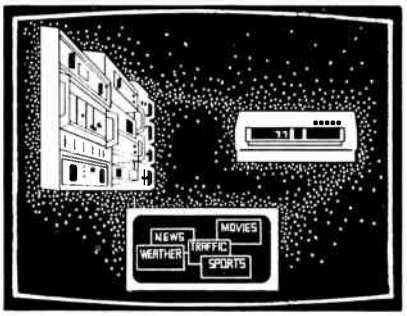

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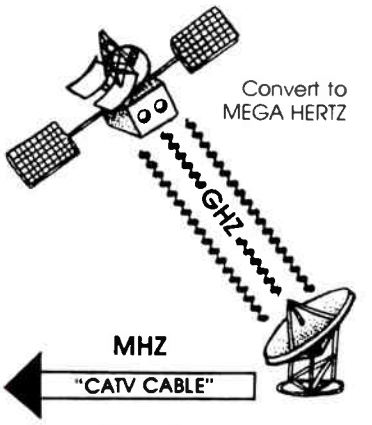

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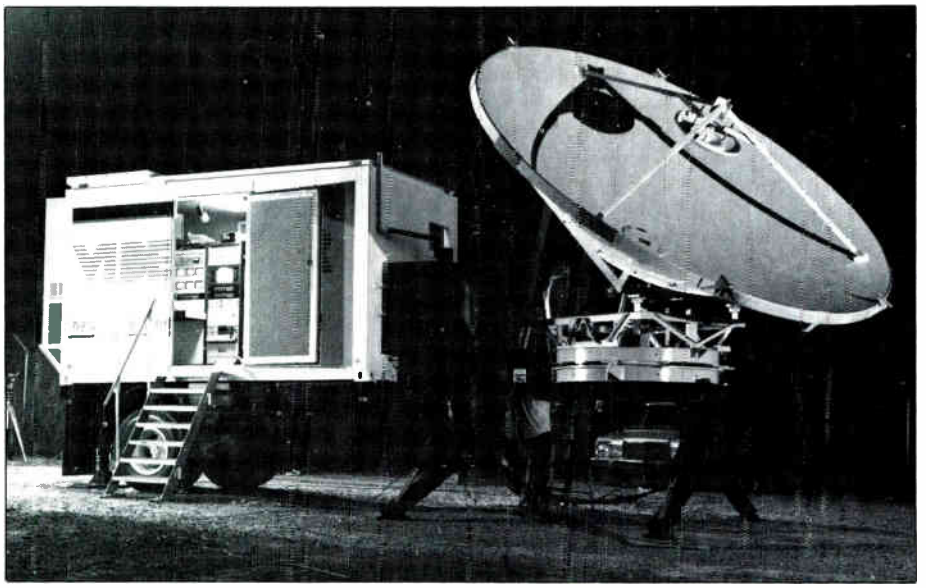
Product News



Microdyne Ku-band mobile uplink system

Microdyne "VideoStar Express"

Microdyne has delivered its first Ku-band mobile satellite TV uplink system, the VideoStar Express, to VideoStar Connections of Atlanta, Ga. This fully redundant system consists of a 5-meter Microdyne parabolic antenna mounted to a 30-foot air suspension single axle trailer, video exciters, downconverters, receivers, a 500 watt high power amplifier system, a 30 KVA diesel generator and an assortment of test and monitoring equipment.

For more information, contact Microdyne Corp., 491 Oak Rd., Ocala, Fla. 32672, (904) 687-4633.

Pioneer demonstrates converter

Pioneer Communications demonstrated its wireless remote 67 converter for systems up to 450 MHz at the Eastern Show in September. This converter, known as the BC-4000 series, offers flexible programmability in channel allocations and a parental control feature. The system also can be programmed to block upper tier video and audio from basic tiers and can be customized to operate with special system programming such as 36 channel, 300 MHz systems without displaying blank channels. Other system features include the company's pace-setting frequency-synthesized phase lock loop circuit, a SAW resonator, wide angle infrared reception and an easy-to-read 16 key keyboard.

For more information, contact Pioneer Communications, 2200 Dividend Drive, Columbus, Ohio 43228, (614) 876-0771.

Microwave Filter unveils DC inserter

Microwave Filter Co. Inc. has unveiled a D.C. inserter for use in blocking and inserting D.C. power into downconverters. Given the model number 4408-FM/FF, this inserter has an operating frequency range of 220-720 MHz and comes equipped with one female and one male type F connector. The unit costs $125.

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

American Uplink's mobile transmitter

American Uplinks has developed a mobile satellite transmitter which, when mounted on a 24-foot diesel truck, is able to provide more agility than other systems mounted on tractor trailer rigs, or so the company contends. The system features a three port feed that permits reception of satellite signals in two polarities and transmission in one polarity. System components include a five-meter Comtech antenna, second generation Variant transmitters and exciters and receivers designed by Scientific-Atlanta.

For more information, contact American Uplinks, (800) 525-9999.

Sony/Tek digital storage oscilloscope

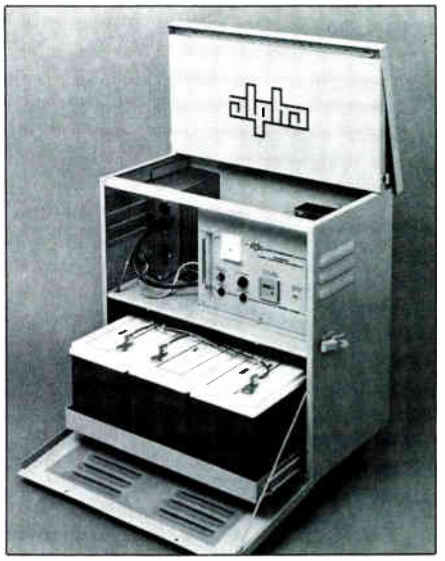
Sony/Tektronix, the joint venture established between Sony and Tektronix in 1965, has designed a non-storage and digital storage oscilloscope, the 336, which, when used in store mode, can measure signals up to 50 MHz equivalent time bandwidth, and, in non-storage mode, signals up to 50 MHz bandwidth. Other features include microprocessor control to permit a wide range of waveform processing, a menu system and alphanumeric CRT readout and store and view modes, which allow cursors to make simultaneous voltage and time measurements on digitized waveform displays.

For more information, contact Tektronix, P.O. Box 500, Beaverton, Ore. 97077, (800) 426-2200.

Alpha Technologies new enclosure

Alpha Technologies is offering a new enclosure for standby power supplies. The unit has a slide-out tray in which batteries are contained, which is sealed off to prevent corrosive gases from damaging electronic circuitry and two padlocks, located on each side, to help ensure security. An inspection door is also located on one side of the unit to facilitate wiring, installation and inspection.

For more information, contact Alpha Technologies Inc., 1305 Fraser St., D-5, Bellingham, Wash. 98226, (206) 647-2360.



Alpha Technologies' enclosure

Modem dials automatically

Concord Data Systems has equipped its new 2400 bps full duplex dial modem with an automatic dialing feature that enables users to initiate telecommunications either manually, by dialing telephone numbers, or automatically, through asynchronous terminal keyboards or software-initiated commands. Modem software, in the manual, automatic or non-interactive modes, provides various levels of call monitoring feedback for real-time viewing and/or record keeping purposes. Other features include an automatic 1200 bps, 212 compatible fallback mode and front panel switches. The modem can also support most widely used protocols and is capable of transmitting at rates of 2400 bps in both synchronous and asynchronous modes.

For more information, contact Concord Data Systems, 303 Bear Hill Rd., Waltham, Mass. 02154, (617) 890-1394.

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Reader Service Number 47

People News

■ **Mark Harrigan** has assumed the post of chief engineer at **United Cable Television** of Alameda. Harrigan's previous experience includes positions as chief engineer, chief technician, technician and installer for the ATC system in Morga, Calif.

■ **RCA Cylix Communications Network Inc.**, a medium- to high-speed satellite data communications service company owned by RCA, has elected **Richard Simmons** to the post of assistant vice president for quality assurance. In his new position, the former assistant vice president of administration will oversee the quality assurance department.

■ **W. Wesley Howe** has been appointed technical manager by **Colony Communications Inc.** Howe will be responsible for assisting chief technicians throughout the Colony systems, negotiationg all FCC correspondence such as microwave filing and licensing and coordinating corporate engineering efforts for new franchises and system rebuilds. A Colony Communications veteran since June 1980, Howe most recently served as chief technician for Colony's Dynamic Cablevision of Florida Inc.'s system.

■ **Bruce Stanley** has joined **M/A-COM Comm/Scope** as product manager for the company's network coaxial cables. Among the duties with which Stanley is charged are development and marketing of coaxial cables for data, military and telecommunications applications.

■ **Doug Frassrand** has been named CATV area sales manager of **Reliable Electric/Utility Products**, with responsibility for the Southern region. Before joining Reliable Electric/Utility, Frassrand was a sales manager for a manufacturer of minicomputer and microcomputers for the security industry.

Richard Siemens

Richard Siemens has also joined the company as CATV product manager. In his new position, Siemans will oversee product development and forecasting of all new and existing products. Siemens previously served as district manager of Anixter Communications.

■ **Lee Afflerbach**, former vice president of engineering for the Bertman Group Inc., has formed a new company **Columbia Telecommunications**, that specializes in the design of local area networks for public institutions, cable companies, institutional networks and large telecommunications systems.

■ **Chuck Krone** was promoted to Eastern regional manager, converter products, for **Anixter Communications**. He was most recently Central regional sales manager. **TOCOM Inc.** announced the opening of a Southern regional sales office in Atlanta, and named **Bob Beeman** Southern regional sales manager. Beeman was previously with General Instrument, Jerrold Division, as district sales manager—Southern states.

■ **General Instrument Corp.'s Broadband Communications Group** has appointed **Frederic LaPointe** business development analyst. LaPointe, who formerly worked as a marketing engineer specializing in data communications strategy for Hewlett-Packard, will now oversee investigation and pursuit of new business opportunities for the GTE division.

■ **Leslie Taylor** has joined **GTE Spacenet Corp.** as director of regulatory affairs. Taylor formerly served as a legal advisor to Ambassador Abbott Washburn and, before that, worked as chairman of the U.S. delegation to the ITU region 2 broadcasting satellite conference and as a FCC commissioner.

■ **Timothy Vass** has been named account representative for **Magnavox CATV Systems Inc.**, with responsibility for selling and promoting the company's CATV products to cable operators in the Mid-Atlantic region. Prior to joining Magnavox, Vaas worked as a sales representative for R.J.G. Enterprises.

■ **Mycro-Tek** has appointed **R. Gene McCutcheon** product marketing manager. McCutcheon, whose previous cable experience includes posts as vice president of marketing for *National Cable-News* and as product marketing specialist and newspaper product marketing manager for Mycro-Tek, will now coordinate national marketing efforts for the firm's Mycro-Vision™ video display information system and for developing and implementing new products and product improvements.

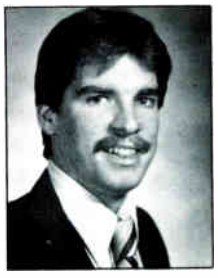
■ **Don DeKoker** has been elected to serve as the new director of member services for the **National Institute for Low Power Television**. DeKoker's previous experience in the field includes an association with the New York-based LPTV Services, a consulting firm specializing in station acquisitions, programming and applicant services.

■ **Microwave Filter Co. Inc.** has elected **Richard Jones** comptroller and assistant to the president. Jones' duties include establishment of accounting policy and procedures, management of financial planning, accounting, purchasing and overseeing credit and collection operations. Other duties Jones assumes are recruiting, training and supervision of all MFC business personnel.

■ **Henry Waldschmidt** has joined **M/A-COM Inc.** as director of manufacturing planning for the company's integrated digital communications group (IDC). Waldschmidt, who brings to M/A-COM more than 20 years of consumer electronics experience, will supervise the planning and development of a manufacturing facility that will produce commercial products for the five IDC companies.

■ **Michael Angelo** has joined **Toner Cable Equipment Inc.** and has taken over reponsibility for regional sales of Toner's Electronics Division's CATV equipment. Toner also has announced the promotion of **Phil Young** to regional sales representative for its CATV Electronics Division.

Michael Angelo



Phil Young

■ **Dimitri Maistrellis** has been appointed plant manager of the Wallingford cable operations for **Times Fiber Communications**. In this post, Maistrellis, who joined Times Fiber five years ago as cable shop production control manager, will oversee all the plant's operations including the manufacturing of fiberoptic glass and cable.

■ **Thomas Malson** has become district sales manager for **Eagle Comtronics Inc.** with responsibility for the western territory encompassing Arizona, Utah, Nevada, California, Oregon, Washington and Idaho. Malson formerly served as regional sales manager at C-COR, sales manager for Western CATV Distributors Inc. and regional sales manager for Magnavox CATV Systems.

■ **Sandra Livermore** has been named product specialist, passive systems for **Magnavox CATV Systems Inc.,** Livermore, who most recently served as marketing support representative for Continental Information Systems, now assumes overall marketing and technical responsibility for Magnavox's line of passive systems.

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- Self cleaning and non-clog design speeds cable prep time by 50%.
- Accommodates today's .412″, .500″, and .750″ O.D. cables plus the next generation .625″ and .875″ O.D. coaxial cables. 85% more affordable.
- Cutting blades are made of alloyed steel that holds edge far longer than carbon steel. There is no flat cutting edge to dull as cutting edge is built-into the helix.

SEPARATE MODEL AVAILABLE FOR 1″ O.D. COAXIAL CABLE

Reader Service Number 48

Pole Line Corp.

SUBSIDIARY OF RMS ELECTRONICS, INC.
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TOLL FREE: (800) 221-8857 (Continental U.S.A., Puerto Rico, U.S. Virgin Islands) · CALL COLLECT: (212) 829-1070 (N.Y. State Only)
WESTERN OPERATIONS: 2901 W. GARRY AVE., SANTA ANA, CALIF., 92704 · TEL. (714) 662-1041

In Orbit

Satcom 3R

Signal	Day	Start/ Stop	Alert Tone	Transponder
ACSN-The Learning Channel	Weekdays Weekends	6 a.m./4 p.m. 6 a.m./1 p.m.	192°/#	**16**
AP News Cable		24 hrs.	None	**6**
ARTS	Daily	9 p.m./12 a.m.	311°/# (E,C,M) 519°/#(P)	**1**
Cable Health Network		24 hrs.	361°/#	**17**
CBN		24 hrs.	414°/#	**8**
Cinemax		24 hrs.	None	**20 (E,C) 23 (M,P)**
CNN		24 hrs.	024°/#	**14**
CNN Headline News		24 hrs.	635°/#	**15**
C-SPAN		24 hrs.	None	**19**
Daytime	Weekdays	1 p.m./3 p.m.	307°/#	**22**
Dow Jones Cable News		24 hrs.	None	**3,6**
Electronic Program Guide		24 hrs.	None	**3**

Major Communications Satellites Serving North America

Location: Degrees West Longitude	Satellite: Present	Satellite: Future
69		Spacenet II
70		Southern Pacific-2 (Oct. 84)**
72	Satcom 2-R	
74		Galaxy-2 (mid 84)
79	Westar-2	
83	Satcom-4	
87	Comstar-D3	Telstar-2 (1984)
91	Westar-3	Spacenet-III
93.5		Galaxy-3 (June 84)
94	SBS-3**	
95	Comstar-D1 & D2	
96	Telstar-1	
97	SBS-2*	
99	Westar-4	
100	SBS-1*	
103		GTE-1* (1984)
104.5	Anik D-1	
106		GTE-2* (1984)
108.5		Anik C-1
109	Anik-B** & C3	Anik D-2
114	Anik A-3	
116	Anik A-3	
117.5		Anik C-3
119	Satcom-2	Southern Pacific-1
122		Spacenet I (Feb. 84)
123	Westar-5	
127	Comstar-D4	Telstar-3 (1984)
131	Satcom-3R	
134	Galaxy I	
136	Satcom-1	
139	Satcom-1R	
143	Satcom 5	

* Ku Band
** Dual Ku/C Band

Orbital slots and launch dates often change without notice

Signal	Day	Start/ Stop	Alert Tone	Transponder
ESPN		24 hrs.	048°/#	**7**
Eternal World Television Network	Daily	8 p.m./12 p.m.	762°/#	**18**
HBO	Daily	24 hrs.	None	**24 (E,C), 13 (M,P), 22**
HTN	Daily	4 p.m./4 a.m.	207°/#	**16**
Lifestyle		24 hrs.	None	**3**
Moody Bible		24 hrs.	None	**3**
Modern Satellite Network	Weekdays	10 a.m./1 p.m.	243°/# 421°/#	**22**
The Movie Channel		24 hrs.	None	**5**
MTV: Music Television		24 hrs.	None	**11**
National Jewish Television Network	Sundays	1 p.m./4 p.m.	None	**16**
Nickelodeon	Daily	8 a.m./9 p.m.	311°/# (E, M, C) 519°/# (P) 749°/#	**1**
PTL		24 hrs.	None	**2**
Reuters News View		24 hrs.	None	**6, 18**
Satellite Radio Network		24 hrs.	None	**2**
SCAN		24 hrs.	None	**6**
Showtime		24 hrs.	576°/#	**12 (E,C) 10 (M,P)**
Spotlight		24 hrs.	None	**4**
UPI Cable News		24 hrs.	None	**6**
USA Cable Network		24 hrs.	601°/#	**9**
USA (during blackout)		varies	295°/# 601°/#	**22**
WFMT		24 hrs.	None	**3**
WGN		24 hrs.	None	**3**
WTBS		24 hrs.	None	**6**
The Weather Channel		24 hrs.	None	**21**

Satcom 4

BizNet	Weekdays	7 a.m./2 p.m.	None	**15**
Bravo	Daily	5 p.m./6 a.m.	None	**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		24 hrs.	429°/#	**3**
Trinity Broadcasting Network		24 hrs.	None	**17**

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

EAGLE

CATV CONVERTER

Eagle's CATV Converter offers more standard features than any other CATV converter on the market.

- ***Favorite-channel memory*** provides subscribers with instant access to their most frequently watched channels
- ***Channel recall*** allows easy return to the last channel viewed
- ***Parental-control capability*** lets parents prevent specific channels from being watched by children
- ***Infrared cordless remote unit*** ensures effortless control of channel selection and fine tuning
- ***TV convenience outlet*** permits easy on-off set control, using remote unit

All standard features assure you field-proven quality performance.

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Reader Service Number 49

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- *Eliminates variables of coupling nut adjustment*
- *Improved return-loss characteristics*
- *Immediate visual inspectability*
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the winning connector from the winning connection

Reader Service Number 50

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