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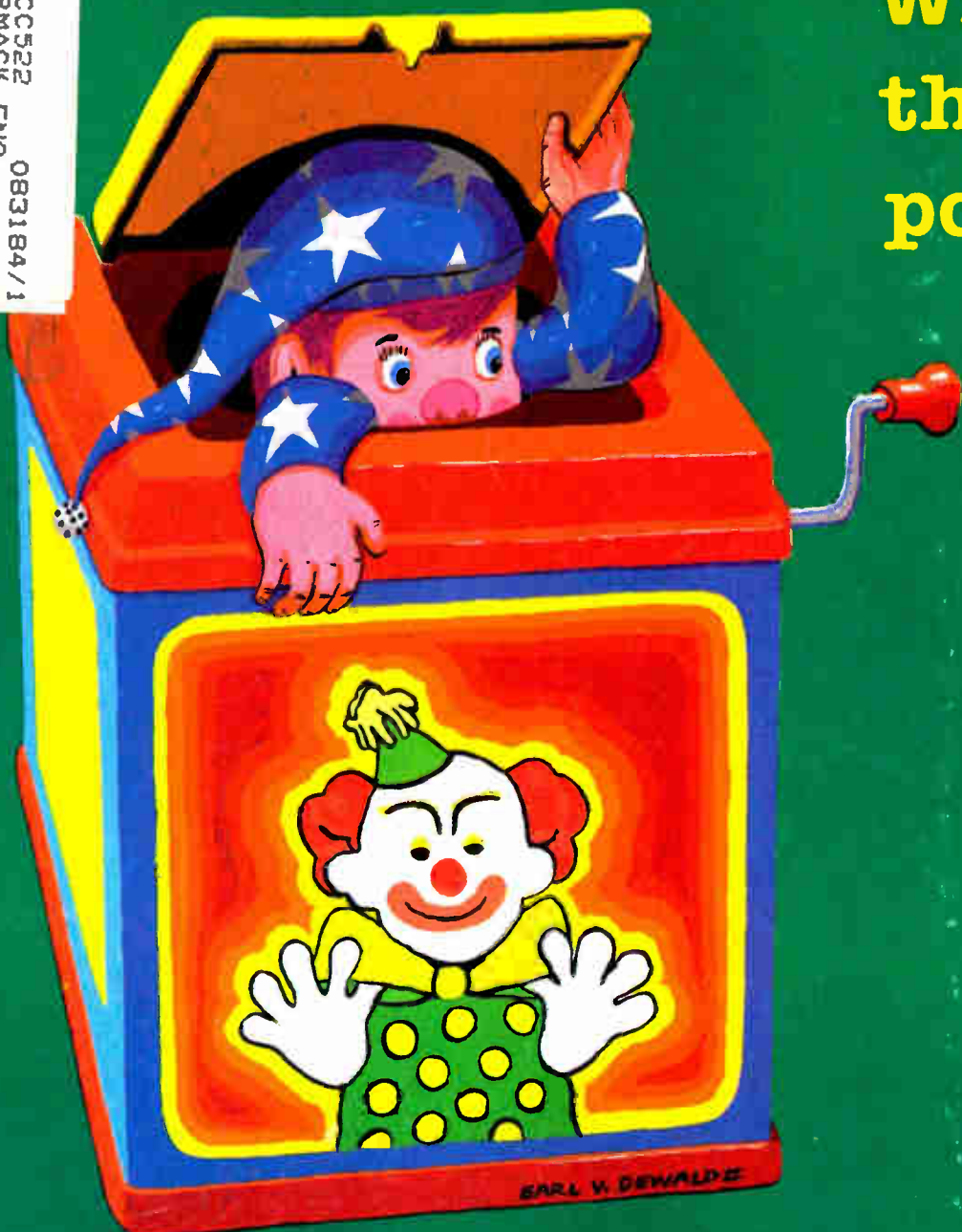
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December 1983

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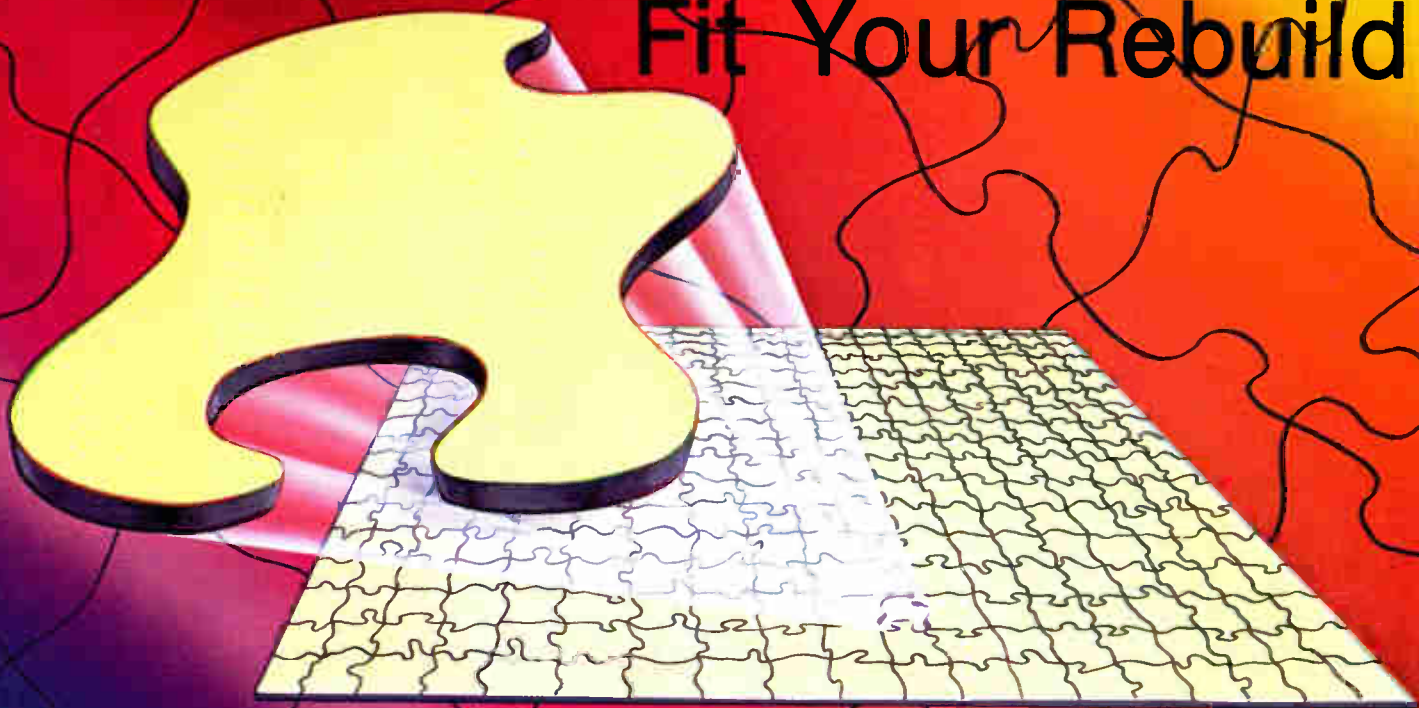
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Reader Service Number 1

# Think TWICE!

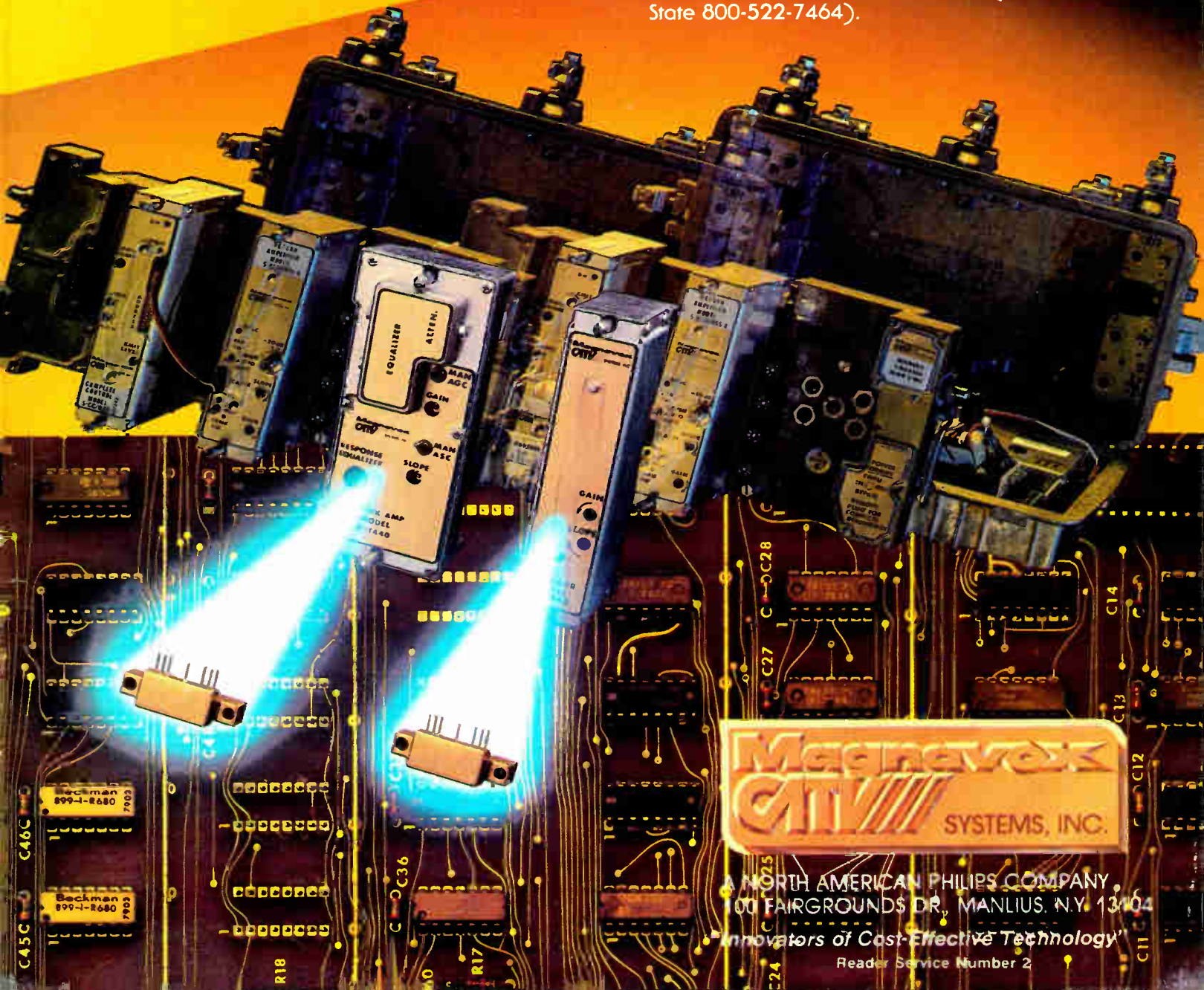
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Reader Service Number 2

## A. D. Little Recommends Jerrold for Philly System

BALA CYNWYD, PA—Noted research and consulting firm Arthur D. Little Inc. was hired by Comcast Corp. to recommend equipment vendors for Comcast's proposed Philadelphia cable system.

In a 136-page report, Little recommended Jerrold Division of General Instrument more often than any other company. According to the study, Little considered, in assessing each vendor's equipment:

- product features and capabilities;
  - soundness of technical approach;
  - compatibility with other system components;
  - risk of unavailability of the product when needed by Comcast;
  - ability to satisfy capacity requirements of a large subscriber population as projected in Philadelphia; and,
  - estimated cost per subscriber.
- For two-way subscriber response (IPPV) services, deemed to be the most important

facet, Little looked at Jerrold, Pioneer, Oak, Tocom and Zenith equipment. Recommended was Jerrold's "Starcom 450 addressable converters with the Starvue SV-A modular attachment for IPPV because of this system's technical elegance, low risk of unavailability and relatively low cost," the report said.

And while the research found one-way addressable converters from Jerrold, Oak, Scientific-Atlanta, Tocom and Zenith "were

considered to be viable for Comcast's Philadelphia system," the company recommended use of Jerrold's Starcom 450 one-way addressable boxes because of the best integration of the recommended IPPV system with the one-way boxes.

E-Com, Jerrold and Tocom general purpose digital systems were considered, with Jerrold again getting the nod. The report found Jerrold's Communicom/Metronet system "qualified and attractive" because of its response to innovation, high capacity and flexibility to meet new needs.

Equipment from

CableBus Systems, Jerrold, S-A and Tocom was evaluated for home monitoring services, with Little reporting "each of these vendor's systems would be well-qualified" in Comcast's Philly operation. But, Little added, Tocom, because of its experience and capability, would be the first choice to be used for both security and energy management. Apart from energy management, though, Little said Comcast should itself choose "among these home security system vendors based on its own judgment concerning features, cost and terms of purchase." □

It's nice to hear a third party confirm what we've been working for all along.

When a noted research and consulting firm was asked to recommend equipment suppliers for Comcast's proposed Philadelphia cable system, they recommended Jerrold. They recommended Jerrold more often than Scientific-Atlanta. More often than Oak, Zenith, Pioneer, TOCOM, E-Com, or Cablebus Systems combined!

They said our addressable systems have "technical elegance." Plus "low risk of unavailability and relatively low cost."

If that's what you've been looking for all along, you may want to give us a call. General Instrument Corporation, Jerrold Division, 2200 Byberry Road, Hatboro, PA 19040. (215) 674-4800.

**Jerrold.**  
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Reader Service Number 3

**INTERFACE 12**

**New fiberoptic dimensions**

A joint venture between Ameritech and Aetna Telecommunications Laboratories aims at expanding the capabilities of fiberoptic cable to include simultaneous voice, video and data transmission. A fiberoptic local area network, currently under development, purportedly will incorporate the "new" technology that makes this transmission possible.

**COMMUNICATION NEWS 19**

**Western Show tech**

A full day of technical sessions at the Western Show will be geared for lower-level technicians and engineers alike. Speakers will address topics ranging from rebuilds and retrofits to new technology and digital encrypted audio transmission.

**COVER STORY 27**

**Cable's ancillary services**

Experts discuss cable's ancillary services and express conflicting views regarding the future viability of cable's security, electronic banking and energy load management offerings. All indicators suggest, however, that cable's videotex is surging forward.

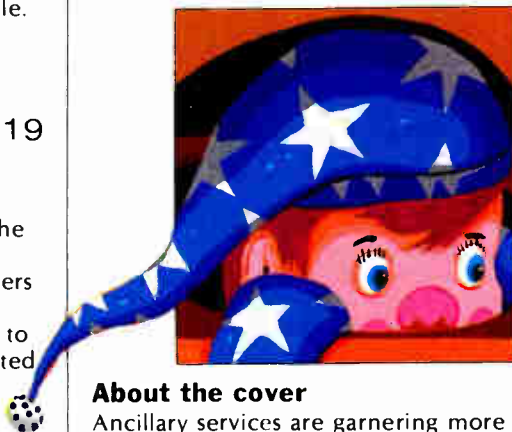
**TECH II 49**

**A simple solution**

Joseph Preschutti of C-COR Electronics proposes using a bi-directional coupler to solve the problem of inaccurate sweeping measurements that occur in two-way systems.



*The Anaheim Convention Center, Anaheim, Calif., is the site of this year's Western Show.*



**About the cover**

Ancillary services are garnering more attention these days, but will they burgeon as predicted? Associate Managing Editor Constance Warren covers the recent developments in home security, electronic banking and meter reading, while Associate Editor Gary Kim focuses on the videotex scene. Cover illustration by Earl V. DeWald.



*Texscan's VS-60B sweep generator*

This month's **Product Profile** focuses on sweep generators and what they can do.

**PRODUCT PROFILE 56**

**Sweep generators**

*CED* examines many of the leading CATV sweep generators currently available and their respective applications.

**TECHXCHANGE 58**

**Point counterpoint**

Jay Staiger of Magnavox responds to Harold Katz' article (September 1983, *CED*) and points out that their respective papers are based on different, and not necessarily conflicting, objectives.

**WESTERN SHOW TECH AGENDA 62**

**Engineering presentations**

An entire day of the Western Show will be devoted exclusively to technical sessions. *CED* provides a list of the speakers, the topics to be discussed and a schedule of the times the sessions will be held.

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## Mai planning cable school

Mai Communications has announced the formation of the Mai Institute of Cable Technology, a training school that is scheduled for a March 1, 1984 opening in leased southern New Jersey facilities. Robert Glass, dean of education, said plans eventually call for completion of a permanent building in Barrington, N.J., where Mai Communications' corporate headquarters are located. Glass said the institute will concentrate on enrolling the person off the street who is interested in getting into the cable industry; technical people working in the cable business who want to upgrade their skills; and non-technical cable personnel who want to learn about the technical side of the business. Tuition costs range from \$700 to \$2,200, depending on the nature of the course. All instructional materials have been developed in-house, drawing on the "more than 130 years of Jerrold experience" of the company's executives. Courses will be offered seven hours per day, with the maximum length of any class being eight weeks. Glass said the school has been developed on a "modular basis," allowing for instruction to be as general or as specific as required. "The general response of people in the industry has been that this is something that is desperately needed," Glass said.

## Pavlic's RF choke patented

C—COR Electronics Inc. has been awarded a U.S. patent for the invention of a device by John Pavlic, engineering manager, distribution products for C-COR. The device, a radio frequency (RF) choke that provides a resonant-free high impedance over the cable television operating frequency range of 5 to 500 MHz, was developed more than two years ago. The choke has been incorporated into amplifiers and signal splitting devices manufactured by C-COR, allowing increased channel capacity while minimizing signal losses. At a recent service awards dinner, Pavlic received company stock and a plaque in recognition of the patent.

## New subsidiary opens in London

Cable TV Supply Co. has opened up a subsidiary in the United Kingdom, the company announced last week. The new venture, Cable TV Supply (U.K.) Ltd. will offer the same range of products as its U.S. parent for the burgeoning British cable industry. The division is headquartered in Epsom, Surrey, south of London, and will be headed by Managing Director Albert Smith. Cable TV supply offers 3,500 products for the cable industry, including aerial and safety equipment, splitters, earth stations and transformers.

## Sony develops multiplexing system

Sony Corp. has announced a new system for multiplexing digital data and transmitting it over cable television channels. According to officials there, the CADA system turns high quality digital sound, facsimile, still pictures, computer games and other data into digital bits and sends them over high speeds to a special receiver. The new technology reportedly can send 256 different computer programs through one channel at one time. CADA is designed to expand the application of cable TV to store information and to decrease the transmission time, according to a Sony spokesman. It could be used for information services, pay audio, pay television, at-home

shopping and electronic message delivery, among other applications. Sony expects to market CADA in Japan next summer and perhaps export the technology to the U.S. sometime after that if it proves successful in the domestic market. Press reports put the cost of the basic transmission system at 7 million yen (approximately \$30,000), with individual reception units at 50,000 yen (some \$220).

## USCI launches DBS in Indiana

United Satellite Communications Inc. late last month launched the first U.S. direct broadcast satellite service—providing five channels of programming to some 200 homes in 26 states. The new entertainment service, received via rooftop satellite antennas, consists of two 24-hour film services, ESPN and two channels offering a variety of entertainment and information programming. Subscribers are concentrated mostly in Indiana and surrounding states. Popular films being shown by USCI in its first month include *Rocky III*, *An Officer and a Gentleman* and *Victor Victoria*. Prior to the launch, USCI announced it reached a number of program licensing agreements, as well as a servicing agreement with RCA Service Co. Under the agreements, USCI will receive movies, entertainment specials, sporting events, video music and other programming from Universal Pictures, Paramount Pictures, 20th Century-Fox, MGM/UA, ESPN, HBO, Viacom International, Samuel Goldwyn, Atlantic Releasing, Polygram, Castle Hill and Almi Cinema 5. Other program suppliers include A&M Records, Picture Music International, Satori Productions, Film Gallery, ATI Video enterprises and Cinema Signal. RCA Service Co., with 2,800 technicians in 168 offices across the country, will install and service home DBS receiving equipment under a service contract with USCI.



*John Fannetti leads Microwave Filter Co.'s recent terrestrial interference seminar geared to provide knowledge of filtering and other avoidance suppression techniques to cure microwave interference in TVRO systems. The seminar is held twice monthly through June, with January dates set for the 26 or 27 of the month.*



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# Seminars

## December

**1:** A seminar on "The New Technologies: Changes and Challenges In Public Relations" sponsored by **The Media Institute** will be held in Washington. Contact Cynthia Brumfield (202) 298-7512.

**5:** **The Institute for Advanced Technology** hosts the third edition of its "Data Communications Update," exploring local area networks, integrated voice and data, and packet switching services, presented live from Washington, D.C., and broadcast via satellite to receive sites around the country. Contact (800) 638-6590.

**5-7:** The third annual "International Tele/Conferencing Symposium" sponsored by **Cross Information Co.** will be held at the Hilton Harvest House Hotel in Boulder, Colo. Contact Thomas Cross, (303) 499-8888.

**5-9:** A **Community Antenna Television Association** advanced technical training seminar will be held at the Howard Johnsons Motor Lodge in Revere, Mass. Contact (305) 562-7847.

**6:** **IEEE** is sponsoring via satellite a one-day short course called "Technologies for the Information Age," intended for personnel in the field of digital communications and digital networks. Contact (201) 981-0060.

**12:** **Paul Kagan Associates** will sponsor a seminar on "Cable TV Security" at the Marriott Hotel in Anaheim, Calif. Contact Genni O'Connor, (408) 624-1536.

**12-14:** A **Jerrold** technical seminar will be held in Philadelphia. Contact Diane Bachman, (800) 523-6678 or (215) 674-4800.

**13-15:** The Western Show, sponsored by the **California Cable Television Association** and the **Arizona Cable Television Association**, will be held at the Anaheim (Calif.) Convention Center. Contact the CCTA, (415) 881-0211.

**14-16:** **Center for Advanced Professional Education** is hosting "Database Systems: Strategies for Information Resource Management" at the Tampa (Fla.) Hilton Inn. Contact (714) 261-0240.

## January

**8-11:** PTC '84, the sixth annual conference of the **Pacific Telecommunications Council**, will be held at the Sheraton-Waikiki Hotel in Honolulu. Contact (808) 949-5752 or 941-3789.

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

**16-18:** LPTV West, sponsored by the **National Institute for Low Power Television**, will be held at the Disneyland Hotel in Anaheim, Calif. Contact Darlene Geller, (203) 852-0500.

**17:** A meeting of the **Southern California Cable Association**, with Satellite Television Corp. Senior Vice President Ron Castell as guest speaker, will be held at the Los Angeles Airport Hilton. Contact (213) 653-6187.

**18-20:** The annual convention of the **Texas Cable TV Association**, the Texas Show, will be held at the San Antonio Convention Center. Contact W.D. Arnold, (512) 474-2082.

**23-25:** The **National Satellite Cable Association** and **Eagan & Associates** will hold a PC/SMATV workshop in Monterey, Calif. Contact Larry Hannon, (904) 237-6106.

## February

**7-8:** The annual meeting of the **Arizona Cable Television Association** will be held at the Phoenix Hilton Hotel. Contact (602) 257-9338.

**14:** 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.  
**21-23:** A technical seminar sponsored by **C-COR Electronics Inc.** will be held in Dallas. Contact Deb Cree (814) 238-2461.

**22-24:** The annual convention of the **North Dakota Cable Television Association** will be held at the Holiday Inn, Fargo. Contact Claude Edwards, (701) 280-0033.

## March

**5-7:** Cable-Tec Expo '84, sponsored by the **Society of Cable Television Engineers**, will be held at the Opryland Hotel in Nashville, Tenn. Contact (703) 823-1911.

**13:** 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.

**15-16:** A "Technology Outlook" seminar conducted by the **University of Wisconsin-Extension** will be held at The Wisconsin Center in Madison. Contact (608) 262-3748.

## April

**17-19:** A technical seminar sponsored by **C-COR Electronics Inc.** will be held in Columbus, Ohio. Contact Deb Cree, (814) 238-2461.

**23-25:** The **National Satellite Cable Association** and **Eagan & Associates** will hold a PC/SMATV workshop in Chicago. Contact Larry Hannon, (904) 237-6106.

## May

**5-9:** EUROCAST '84, sponsored by the **Society of Cable Television Engineers** and **Satelliten Rundfunk**, will be held at the Swiss Industrial Fair in Basel, Switzerland. Contact Mark Voss, (713) 463-0502.

**15-17:** **C-COR Electronics Inc.** will conduct a technical seminar in San Francisco. Contact Deb Cree, (814) 238-2461.

**15-18:** An international exhibition of telecommunications, radio and information technology, **Communications '84**, will be held at the National Exhibition Centre in Birmingham, England. Contact (201) 652-7070.

## June

**3-6:** The annual convention of the **National Cable Television Association** will be held at the Las Vegas (Nev.) Convention Center. Contact (202) 775-3629.

**11-14:** The **Canadian Cable Television Association** annual convention will be held at the Capital Congress Center in Ottawa. Contact (613) 232-2631.

## Looking ahead

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

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

**Feb. 9-14:** National Association of Television Program Executives convention, Moscone Center, San Francisco.

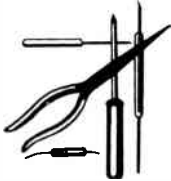
**March 5-7:** Society of Cable Television Engineers Cable-Tec Expo '84, Opryland Hotel, Nashville, Tenn.

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

**June 11-14:** Canadian Cable Television Association convention, Capital Congress Center, Ottawa.

# BRAD

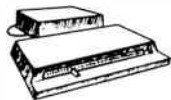
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Reader Service Number 6



## Non-entertainment for safety's sake

As I sat watching "The Day After" recently and saw the town of Lawrence, Kansas, and the University of Kansas, where I went to graduate school, evaporate, I wondered about a number of things. Naturally, nuclear war was one of them, with all of its associated effects, but another thought was of the value of communications during such a crisis.

Granted, there are emergency warning systems such as blaring horns and the Emergency Broadcast System that periodically runs—as a test—on the broadcast stations, but what kind of service can cable offer in times of emergency?

Presently, The Weather Channel is capable of providing local affiliates with storm/tornado warnings that appear on the screens of viewers, but this is primarily adapted for weather conditions. Broadcast stations in some states, like Kansas, display tornado or other storm symbols in a specific corner of the television screen if such weather conditions appear, but for those watching cable channels, there is really no service that alerts viewers if any danger, regardless of what it is, is imminent.

At the present time, The Elra Group of San Francisco, a research organization, recently received a grant from the Federal Emergency Management Agency to study the flexibility of extending the Emergency Broadcast System to cable television systems. While this is an excellent step in the right direction, it is one that will take 18 months to examine. There will, however, be two field tests that will study the effectiveness of the Emergency Broadcast System over automated channels and then by interrupting all video channels. I believe the results will be in cable's favor, but there should not just be a single project, but many that can explore all the possibilities of informing the public through cable.

As we all have noted, as the cable industry begins to penetrate further into the homes of America, more people are going to be watching cable. This is why we need an emergency alert service, whether it be the Emergency Broadcasting System or some other form of quick contact. As we explore in this issue some of the non-entertainment services that cable presently offers or is on the verge of offering, the concept of an emergency alert service is a valuable consideration for cable television. It is particularly applicable to those systems that presently utilize a security service for they most likely have the capability to monitor the Emergency Broadcast System or other signals that would notify listeners if an emergency took place. By installing a light that would flash on and off on the security device within the household, or sending a signal down the line that would ring or sound off, the security central point could inform its customers to tune into a particular channel. The same could be said for videotex. By running a flashing symbol on all pages that the subscriber turns to, he or she could then turn to a specific emergency alert page (as indicated by the flashing symbol) and learn more about the emergency. Naturally, all systems utilizing a character generator in house could prepare some sort of alert page that could be displayed on the automated channels—and remain there, but most importantly, this page should interrupt all other video channels, especially those that have the highest viewership—some of the standard basic channels and the pay services, in particular.

Non-entertainment services are the next hurdle for cable operators to mount. We have been talking about them for some time now and the topic will pick up in the days, months and years ahead. Data transfer, fund transfer and other business communications services are one factor, but security, health/medical alert and shop-at-home are other avenues of exploration. Furthermore, important news, reports and lastly, emergencies, must find their respective places on the cable system. Whether it's news that the President has been shot, or a farm report that livestock should be brought in before the impending blizzard or news that the Soviet Union has invaded West Germany, this kind of information has to be sent to the cable viewer. And, sad to say, with movies like "The Day After" appearing on television, whether it's broadcast or cable, more people are growing concerned about the need to be informed should such a terrible event occur. And information and subsequently, emergency alerts, are one service that the cable operator must provide, for everyone's benefit and safety.



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## Aetna, Ameritech fiberoptic LAN

*Joint venture will offer simultaneous voice, video and data transmission via fiberoptic cable*

WESTBOROUGH, Mass.—Aetna Telecommunications Laboratories, a partnership between G.R.E. Technology Inc. and Aetna Diversified Technologies, and American Information Technologies Corp. (Ameritech), the parent company of five midwestern telcos, have entered into an agreement involving the development of a local area network business communications system that uses fiberoptics as the conduit for transferring information.

The system, which will be developed by Aetna Telecommunications Laboratories and funded by Ameritech, will provide simultaneous high-speed transmission of voice, video and data on single or multiple fiberoptics cables, company officials claim. This capability will enable a business to use one system for all of its internal communications and information transmission needs.

Another advantage of the network, Aetna Telecommunications President Glenn Elion identified, is its ability to interfere with any other type of communications network currently in operation. This ability permits the user to utilize the network not only for internal communication purposes but for outside communication as well. Consequently, businesses using the network do not need to have another communications system installed in their premises to be able to access long distance lines, etc.

A new technology, which Elion declined to discuss in detail, was developed specifically to provide the interface between the network and other communications mediums operating outside of the network. Additionally, signals transmitted on the network can be received by a myriad of devices—including telephone receivers, video terminals and computers—which relieve the user from the burden of having to buy new equipment to receive the network.

Conceptually, the system operates through the use of two principal components: a fiberoptic cable network and nodes, installed in various places within the network. The telephone or computer transmits the signal to the node, which then connects the signal to the fiberoptic cable, which, in turn, either distributes the signal to an

external communications system for out-of-office communication or relays the signal to the appropriate receiving device within the network. As many as a couple of hundred terminals can be supported by one node. The fiber star network is also passive in nature, which reduces the likelihood of system outages.

One of the network's most interesting features is its use of "least cost routing." This technique, Elion explained, allows the user to "remotely dynamically reconfigure" the system to exploit incremental changes in the rates of long distance and other forms of "routing." Furthermore, this feature is complemented by another "remote" capability, referred to by Elion as "remote diagnostics." This capability reduces the need for an extensive staff of repairmen to fix network components.

However, the developer of the system will not be its manufacturer. An outside manufacturer will be chosen for that task. The reason behind this decision, according to Elion, is that Aetna Telecommunications Labs does not have the physical resources or facilities or manpower to mass produce the system once it has been developed. As of press time, no manufacturer had been chosen and Elion did not expect one to be selected until sometime next year.

Both American and Aetna Telecommunications Laboratories anticipate the system to go on-line in 1985. At that time, both companies will engage in its international marketing. Just what role the manufacturer will play in this part of the venture has not yet been determined, Elion said.

—Constance Warren

## Insource arising

*HVC Corp.'s R&D project results in new firm offering videotex and related services*

DALLAS—The growing trend toward integration of computers and communication networks has spawned a host of fledgling industries—such as videotex, data transfer, electronic mail, teletext, etc.—and has led to the formation of a number of new firms hoping to take advantage of these novel market opportunities.

Insource Corp. is one of these firms. Established just a little more than two months ago, Insource represents the culmination of R&D efforts undertaken by a privately held Dallas firm, HVC Corp., in the area of videotex and related services. According to Insource Chairman Lloyd Haldeman, HVC created Insource as a "marketing organization" that would offer videotex, cabletext, public information terminals and advertising sales services to consumers and businesses alike.

In the two years preceding Insource's inception, HVC spent approximately \$4.5 million developing these services and the complementary technology necessary for their transmission. HVC has licensed all of this technology to Insource and also has agreed to continue providing the firm with

videotex research, development and market test studies.

Already, HVC has received some reward for its efforts. Insource recently premiered its cabletext service to 750,000 subscribers on channel 64 of Warner Amex's QUBE Dallas system. Commensurately, the firm announced the signing of a three-year agreement with Warner Amex to offer cabletext services to QUBE subscribers in the Dallas region.

The Insource Information Channel, as Insource's cabletext service is better known, is a three-hour electronic entertainment guide that contains updated information on activities being held in Dallas. Fifteen different categories of information separated into three one-hour segments are cablecast on the system 24 hours a day. These 15 categories cover topics ranging from movies and entertainment to sports and recreation. The information is transmitted in full color graphics through the use of an alphamosaic Prestel system that supposedly offers higher resolution graphics than those provided by more traditional alphanumeric

character generator devices.

The company also has reached an agreement with three shopping malls and an estimated nine hotels and six office buildings to supply videotex services. These services will be conveyed through dedicated phone lines from Insource's DEC host computer to either videotex terminals or to IBM PC or Commodore 64 computers. Customers at shopping malls can access electronic shopping guides by pressing a button on one of several videotex terminals located within each mall. Businesses, on the other hand, can use their IBM or Commodore computers to tap into the Insource host computer. Once connected, businesses can request and receive information similar to that which appears on the Insource cabletext channel. The advantage with the videotex service is that the consumer can request and receive specific information almost immediately.

The computer technology Insource is utilizing to provide these services also can be used for advertising sales and electronic mail and to play video games and tap into national services such as Delphi and Dialog. Haldeman claims the company's advertising list has grown to a total of 80 within a three-month period.

These latest developments mark the initial phases in Insource's long-range plan to exploit what many videotex industry observers believe will mature into a \$30 billion industry nationwide by 1993. In the interim, Insource hopes to begin operating 43 videotex systems in cable franchises across the country.

—Constance Warren

## Viewing future trends

*RCA's Murphy predicts total communications capabilities from a universal terminal*

DENVER—In a recent speech to the International Telecommunication Union's Telecom '83 conference in Geneva, Switzerland, RCA Communications Chairman Eugene Murphy predicted that "Total communication capabilities—voice, data and television—from a universal terminal... will be available" in the near future.

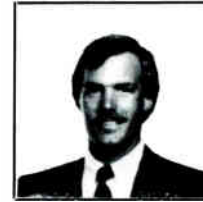
Murphy's talk touched on a wide range of subjects, including enhanced

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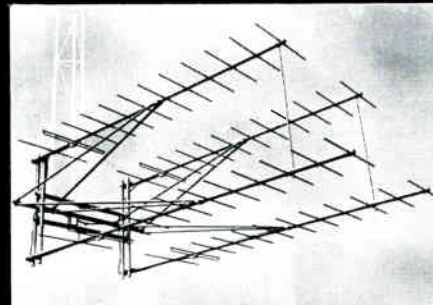
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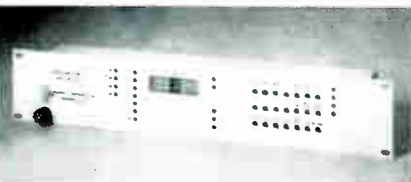
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Reader Service Number 9

## Interface

data networks, electronic mail and cooperative television transmission. Murphy said the demand for enhanced services has created a "ripple effect" as new software and hardware for these technologies is being sought.

"More than one manufacturer of computers and peripheral equipment for advanced telecommunications services is unable to meet the increased demands," he said. "Backlogged orders are becoming a serious problem. No sooner is one new system or service in place, than our customers are hammering down our doors looking for a new enhancement or a better service. However, these are the unmistakable signs of a healthy and growing industry."

Murphy said on-line interactive data networks will soon be available to international telecommunications customers. The networks will offer constant access to host computers by means of a permanent virtual circuit and synchronous communications capability. "They will be satellite based and will provide end-to-end network management and diagnostics at a fixed monthly cost," he predicted. "Customers will enjoy immediate access to information without repeated dial-ups to access the data base."

Regarding electronic mail, Murphy said the same packet switched network transmitting data retrieval information services could be used for the "mailbox" service. He cited the need for standards allowing the interconnection of various systems as "the greatest problem facing international electronic mail." Murphy added that a directory similar to the international telex directory must be developed to enable electronic mail customers to locate one another.

"We believe there is tremendous potential for this service," Murphy said, "and we anticipate that by 1990 it will be an important facet in the spectrum of international telecommunications services available to consumers."

While admitting that international television transmission is not new, Murphy cited a recent Metropolitan Opera performance of *Don Carlo* as an example of the increased opportunities available in the international programming arena. The opera was transmitted live from New York City by RCA Communications' domestic satellite network to the international earth station in Maine and then to Europe via Intelsat.

Said Murphy: "There is a real future for this kind of cooperative television transmission, especially as the relationship between Comsat, the U.S.' Intelsat representative, and the private satellite carriers changes. Assuming carriers in the United States are allowed to access Intelsat facilities directly, we foresee increased opportunities for live television transmissions of all kinds."

## Download

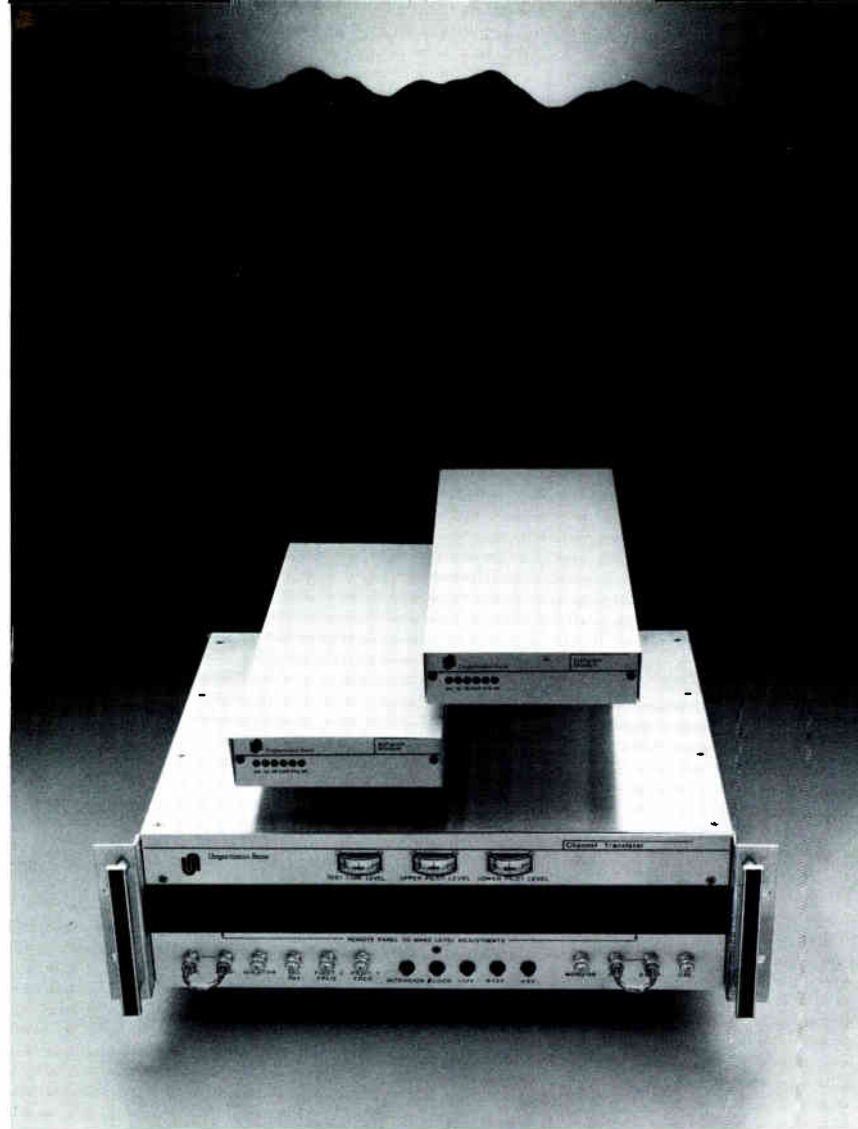
■ **Lanier Business Products Inc. has merged into Harris Corp.** Lanier's Chairman Gene Milner has been elected to the Harris Corp. board of directors. Milner will continue to head Lanier Business Products, which will now operate as a subsidiary of Harris Corp.

■ **M/A-COM Linkabit Inc. has received an order from Digital Equipment Corp.'s Shrewsbury, Mass., facility for a 2200 line switching network.** The order represents Digital's commitment to IDX-3000 local data network systems. The IDX-3000 system upgrades the traditional port selector data switch to serve distributed environments up to 4.5 square miles using only twisted pair wiring and T1-based architecture. Use of T1 allows direct interfaces to microwave, fiberoptic and satellite technologies. The IDX-3000 is a non-blocking system that supports up to 19.2 Kbps asynchronous data ports from one 6-foot rack.

■ **Bizcomp Corp. and Hayes Micro-computer Products Inc. have announced the signing of a licensing agreement.** Hayes will pay Bizcomp an undisclosed amount in return for use of modem design technologies held under a patent by Bizcomp. The patent protects basic techniques used to control command driven modems.

■ **Quazon Corp., manufacturer and marketer of videotex computer terminals, filed with the Securities and Exchange Commission for an initial public offering of 1.35 million shares of common stock.** Proceeds from the sale will be used for working capital, product development and operating expenses.

■ **BL Associates Inc., a Chicago-based videotex consulting firm, has announced the opening of its Videotex Planning Service.** The service is aimed at helping advertising agencies in marketing clients' products via videotex. The service includes five in-depth reports about advertising in videotex, a monthly newsletter and a library access telephone service. **CED**



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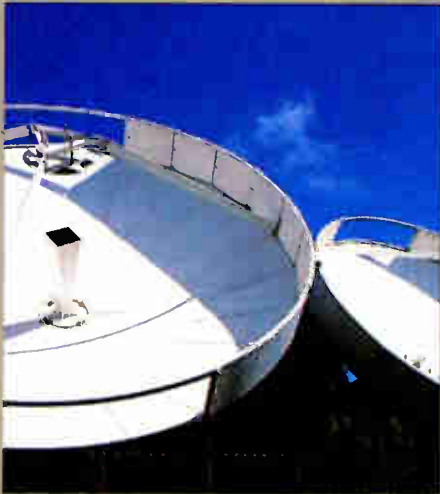
system with dedicated channels between points where contention-free service is desirable.

And because we are the Net/One® Company, our cable design and testing services can help you get your data network moving in the right direction, no matter where you are now.

Both the 19.2 and 56 Kbps models are available for immediate delivery. Please call or write for Broadband Network Modem specifications: Ungermann-Bass, Inc., 2560 Mission College Boulevard, Santa Clara, California 95050. Telephone (408) 496-0111. Or call our Broadband Technical Support Group, Burlington, Massachusetts, (617) 273-5858.

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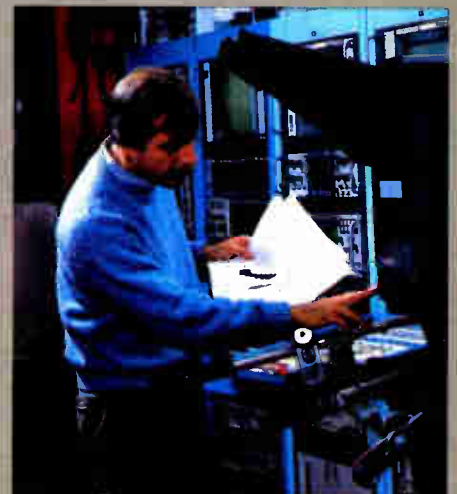
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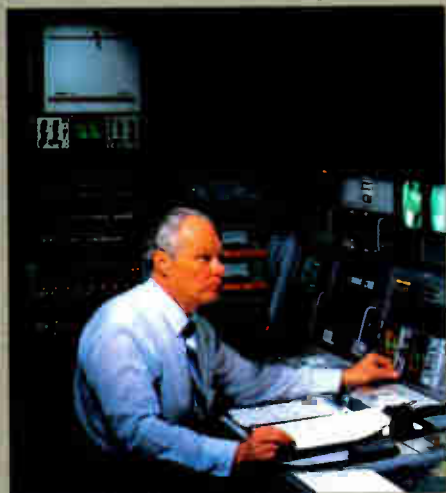
ANSWER is able to provide unattended monitoring of head ends, microwave links, satellite earth stations and distant transmitters. The need for dedicated station personnel at remote sites is minimized because ANSWER can be operated over voice-grade telephone lines. It can even be programmed to alert you automatically if measurement limits are exceeded. You save the time and expense involved in making unnecessary trips to distant stations.



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Equipment proofs, troubleshooting and maintenance are all ANSWER-easy. It provides quick, conclusive verification that new equipment is up to a manufacturer's specifications. And testing current equipment can be accomplished on a regular basis in much less time and with much less trouble than it takes to make the same measurements manually. Highly skilled personnel are freed for more productive activities, and the risk of interpretive errors is lessened considerably. You can have complete confidence in measurement results because of the repeatability you get with ANSWER over long periods of time.





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ANSWER is the time-saving approach to systems evaluation. Major signal sources and critical points in each transmission path can be checked automatically. Testing an entire system takes much less time than it would to make the same measurements manually; personnel workloads and constraints of time need no longer be an obstacle. In addition, graphs and hard copies provide a permanent technical record that serves as an accurate basis for trend analysis and reference for future maintenance.



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and development, ANSWER provides thoroughly accurate, repeatable test results, plus authoritative verification documentation to include with shipments.

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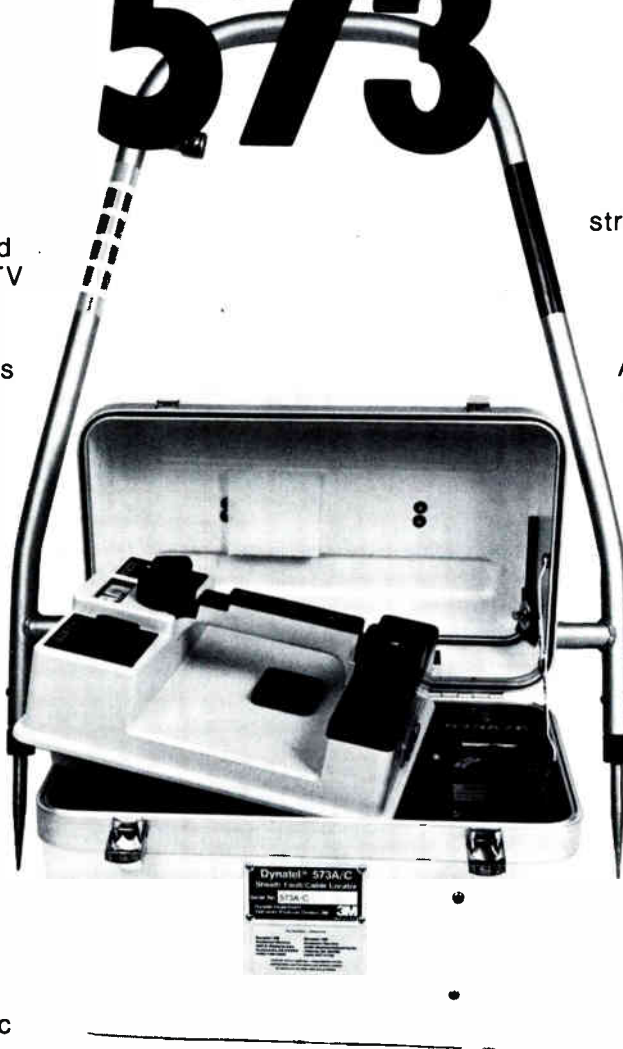
strength conductors.

**With its POWER mode,** you just use the hand-held receiver to trace induced AC voltage sources that interfere with the TV signals on your cables. Or trace the energized power cable itself.

In short, we've put every known method for shield to earth fault and cable locating into one easy-to-use tool for the CATV industry user. Instead of the two or three you're stuck with now.

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## Western Show preview

*Tech sessions, panel discussions featured during three day convention*

DENVER—The 1983 Western Cable TV Show and Convention, scheduled to convene Dec. 13-15 at the Anaheim Convention Center in Anaheim, Calif., will feature a full day of technical sessions on Wednesday, Dec. 14, with Society of Cable Television Engineers President Tom Polis spearheading the activities by delivering the welcoming address at 8:30 a.m.

Polis, who also will moderate the "Rebuild: Retrofit or Renew" session slated for 10:30-12:30, anticipates updating attendees on the state of the SCTE in his opening remarks. "There will probably be questions about what has transpired since Judy Baer (who resigned her SCTE executive vice president post Oct. 31) left," he said. Polis intends to inform the technical community about the relocation of SCTE headquarters to West Chester, Pa., in addition to addressing general technical issues.

According to NCTA Director of Engineering William Riker, who is co-chairman of the program along with Robert Vogel, and also serving as a moderator and presenter during the sessions, "A strong effort has been made to gear this year's sessions to the lower-level technicians as well as the engineers."



**Tom Polis**

All sessions will be held in the Orange County Room within the convention center. Discussion topics range from microwave frequency coordination and the effect of 2 degree satellite spacing to digital encrypted audio transmission and multichannel TV sound.

Riker cited the "Grounding Requirements" presentation by Viacom Vice President Joseph Van Loan, which is pegged for the 8:30-10:30 "Broadband Engineering Issues" segment, as a topic of importance and interest to personnel "from the installer on up." Recent



**Joe Van Loan**

reports of homes being damaged from improper grounding by installers makes Van Loan's talk especially relevant. "The pitfalls that installers can run into" regarding bonding requirements will be covered in the session, Riker said.

Within the broadband issues morning session, Riker will give a brief update on the SCTE's professional certification program. "Since the FCC dropped its first-class license program and is not certifying engineers, the SCTE has taken up the slack, certifying engineers and technicians who complete courses and pass the test administered by local SCTE chapters," Riker said. The SCTE is in the process of restructuring the program, and Riker will explain "how the new changes are going to evolve."

Changes in the certification program include the addition of a Broadband Communications Technician (BCT) certification, which is expected to double the number of certifications conferred by the SCTE. The new BCT designation will, in effect, create a system whereby technicians can work their way up to the Broadband Communications Engineer (BCE) status via a step-by-step process.

Riker also is expected to discuss the new study guide being developed by



the SCTE, which is designated to aid those seeking certification. SCTE's Polis described the guide as "more of a bibliography," listing articles and books published in the areas of specialization that the certification test will focus. The SCTE will publish the study guide, and papers and books listed therein will be provided upon request at a "minimal fee" to spare applications the high cost of buying the materials while preparing for certification.

Polis will moderate the 1:45-12:30 session on rebuilds, which will concentrate on a "total systems approach to a channel upgrade, of any size or type, including both theory and practice." Panelists include: Dan Pike, vice president of engineering for Prime Cable; Fred Rodgers, president of Quality RF Services Inc.; and Jay Staiger, project manager, Active Systems, Magnavox.

Riker said the rebuild session should be "important because of the extensive rebuilding going on around the country." A similar session was held recently at the Eastern Show and was well attended.

Steve Ross, chief of the cable TV branch of the FCC Mass Media Bureau, is expected to moderate the "New Technology" session scheduled for 2:30-3:45 p.m. Ross anticipates that the session will deal with "how cable will absorb the new developments and react to competition from outside." Ross said that "it should be an interesting session," and could focus on such areas as how cable will respond to demands from outside the industry to utilize its channels. "The FCC continues to be the referee even though it maintains a hands-off attitude" regarding the development of new technology, Ross added.

Riker will moderate the session on multichannel television sound scheduled for 4-5 p.m. "Filings are due at the end of December," Riker said. "This session is timed to enlighten people about what's going on and to give people time to comment to the FCC." Alex Best, manager of research and development for Communications Products Group, Scientific-Atlanta, will discuss in broad terms the NCTA's multichannel sound test results. "Multichannel sound is going to come. It's inevitable," Riker said. The session will focus on "how

cable will adapt," he explained.

Riker said he is hoping for a lively 550 MHz presentation during the new technologies session. Re-emphasizing the fact that sessions will be directed toward all levels of technical personnel, Riker said the combatting-theft-of-service presentation by Chuck Peters of Cox Cable, San Diego, will be aimed "toward the field service people, not the managers."

California Cable Television Association Director of Administration and Operations Jerry Yanowitz said he expects the 1983 version of the Western Show to be "a little bigger than last year, up 5 to 10 percent, with slightly more exhibition space." Approximately 250 to 275 exhibitors are expected to show their wares.

A number of new products will be unveiled at the show. At press time, Comtech Data, Control Technology Inc., Blonder-Tongue Laboratories Inc., Scientific-Atlanta, Channell Commercial Corp., Oak and Coaxial Analysts had been counted among the firm's exhibiting new equipment.

Comtech Data will introduce the M505 Broadband Modem, which has been designed for full-duplex transmission of digital data over broadband

cable systems. Control Technology has developed a compact, lightweight 20 Amp uninterruptible power system, the 20 Amp Phoenix, which it will display in Anaheim.

Scientific-Atlanta will show off its new Series 365 block downconverter, which allows integration of S-A's Model 6650 receivers into a system using a low noise amplifier (LNA). Blonder-Tongue will display several new pre-fabricated headends for processing and converting off-air, satellite and local origination signals in cable systems, as well as several pre-fab miniheadends for off-air channel systems, which can be customized for individual cable operators. Channell Commercial will introduce its UTH-708 and USH-716 air and water tight enclosures. Oak will unveil its new baseband Sigma decoder. Coaxial Analysts will show its MAGIC computer graphics system.

Lest attendees think the Western Show will be all work and no play, golf and tennis tournaments are scheduled for Tuesday, Dec. 13.

For more information on new products to be unveiled at the Western Show see "Hardware Hotline," page 68.

—Frank Hogan

## UPI, Telecrafter team up

Companies form UPI Data Cable Corp. to distribute news and information

DENVER—United Press International and Telecrafter Corp. have announced the formation of a new company, UPI Data Cable Corp. The company will market and distribute UPI news and information to cable systems, MDS, LPTV—"anything cable-related," explained Telecrafter President Peter Mangone Jr.

The service, which will operate from a central computer based in Denver, will receive information via satellite from UPI's 160 news and information bureaus worldwide. The set-up represents a six-figure investment, Mangone said. The hardware has yet to be decided.

Cable systems will have two services available:

- The first service is an "upgraded" alphanumeric service, Mangone said. It will permit operators to format on more than one channel or to devote a daypart to one news category, such as financial information, news or sports.

- The second service will be available as a pay service to subscribers who have personal computers. The price will be similar to rates for other pay services, Mangone said.

The two-way service will allow subscribers to call up specific information. Through a "prioritization system," Mangone said, the computer will constantly update its information. Events will remain on the system based on their importance and on when they occurred. Initially the system will have a capacity to store information for one or two days, but eventually that may expand.

The alphanumeric service will go online immediately. The other, enhanced service should launch sometime in 1984, Mangone said. The company is aiming for mid-year. The two services will be available to all systems that currently receive UPI's alphanumeric services.

There will be "no significant rate change" to use the new service, Mangone said. He added that systems will continue to have the option of receiving "the same services at the same prices. But they'll have opportunities to upgrade." There are currently 500 systems that subscribe to UPI alphanumeric services. Mangone said that the company hopes to add another 200 or 300 systems with its new services.

—Madeline Hardart

## NCTA solicits tech papers

*NCTA sets deadline for technical abstracts for June 1984 convention*

WASHINGTON—The National Cable Television Association has issued a call for technical papers for its 33rd annual convention, scheduled for June 3-6, 1984 in Las Vegas, Nev. Outlines or summaries of approximately 200 words on any communications engineering topic of interest to the cable television community are due Jan. 4, 1984.

Only non-commercial, original (not previously published) proposed papers of significant reference value will be selected by a subcommittee for inclusion in the NCTA's technical program and conference proceedings. Authors are advised to avoid a salespitch in their treatment of a product, system or company, in order to adhere to the engineering forum concept of the NCTA technical sessions.

Authors selected by the subcommittee will be notified by Feb. 1, 1984, and will receive an author's kit from which to prepare the paper. The complete paper will be due six weeks after notification of selection. Oral presentations within NCTA technical sessions will be limited to 15-20 minutes generally, but the manuscript can be as long as 10 camera-ready pages. The papers will be published in the 1984 NCTA Technical Papers volume.

NCTA spokeswoman Katherine Rutkowski anticipates between "40 and 60" papers to be selected. "Last year we received over 100 (outlines) and the subcommittee selected around 50" for full development into papers. Rutkowski added that she is "always surprised" by the subject matter of the papers. "Last year we received quite a few on cable system design and the year before, many of them concentrated on enhanced services," she said.

Summaries or outlines should be submitted to Wendell Bailey, vice president of science and technology, National Cable Television Association, 1724 Massachusetts Ave., N.W., Washington, D.C., 20036.

# Standard's Agile 24:

**“If it wasn't the best receiver for the money, we wouldn't use it.”**

*American Television & Communication Corporations (ATC)*

ATC is not the kind of company to pass out comments like this lightly.

One of the oldest cable operators around— 1968—with more than 135 systems nationwide, ATC can afford to be extremely picky when it comes to choosing the types of equipment specified for their systems.

Which is why they took a long hard look at Standard's Agile 24 receiver, putting it through its paces in such diverse environments as Columbus, Ohio; Two Rivers, Wisconsin; Kissimmee, Florida; and Raleigh, North Carolina.

ATC also liked the Agile 24's specifications, and price. But it was nearly a year before they would let us say it. They wanted to be sure, and we respect them for it.

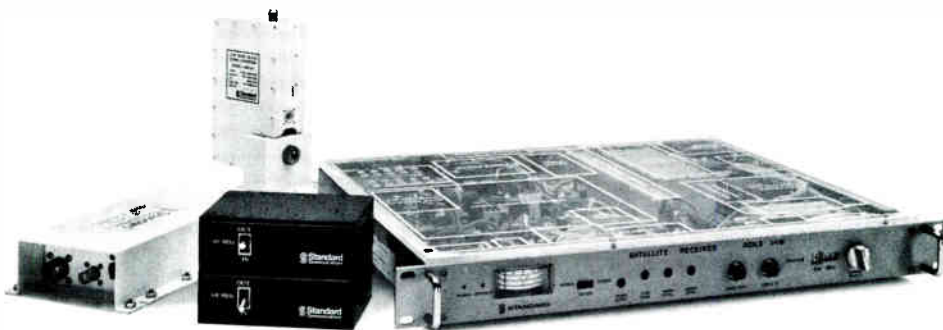
Our relationship with ATC is no different than any other customer. They expect quality, reliability and service—and we're becoming known as a company that delivers this and more.

In addition to the Agile 24 stand-alone, 24-channel receiver, our TVRO product line also includes MSO quality low noise amplifiers/block down converters, microwave interference filters, and earth station antennas, plus full system design service and field technical support.

Standard has the industry knowhow to put you in the cable business or improve the quality of your service.

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## Recording studio debuts

*Denver Center for the Performing Arts opens state-of-the-art facility for video and audio production*

DENVER—This Nov. 3, the former county jail here became caretaker to a rather unusual tenant when the Denver Center for the Performing Arts (DCPA) opened up a research and recording studio within the confines of the renovated jail that also houses other DCPA offices.

The DCPA center, which reputedly represents the latest in the state-of-the-art in video and audio recording technology, is the final product of collaborative efforts undertaken by the DCPA, Dr. Wilbur Gould, director of recording and research for the center and founder and chairman of the board of The Voice Foundation, and the architectural firm of Kirkergaard and Associates.

Most of the center's rooms are allocated for video and audio recording purposes. There are, however, four laboratories and two additional rooms exclusively devoted to research activities. Musicians can visit these rooms to learn how to detect and avoid voice fatigue and other physical ailments that frequently afflict members of the musical profession.

Commercial as well as educational and culturally edifying projects are scheduled to be undertaken by the center. "The new facilities were created with the idea that they would be used to record visual and audio performances," Lawrence Kirkergaard of Kirkergaard and Associates explained.

Among those performances to be recorded, Donald Seawell, chairman of the board and founder of the DCPA, elaborated: there will be productions the center intends "to sell to cable, public and even TV at large." These prospective commercial ventures are part of the DCPA's long-term objective to convert the recording and research facility into an overall profit producing entity that counterbalances the yearly losses incurred by other DCPA divisions. The facility also enables the DCPA to create its own recording label, which "we'll do," Seawell emphasized.

Out of the \$4.6 million it cost to build and equip the facility, approximately \$5 million was spent on video equipment. This equipment, which helps distinguish the center from others of its kind, consists of a Sony network quality camera, Sony VTRs, two Tektronix waveform monitors, Panasonic video monitors, two Leitch sync pulse generators, a Grass Valley switcher, a Sony BVE-3000 editing system, two Sony BVT-2000

time base correctors and a Videotek 5RS-10A.

Other features of the 60 x 30 x 30-foot studio include five TV curtain cycloramas, two sets of portable floor coverings, a suspended catwalk grid system with adjustable lights, floor moveable studio lights and a 32-channel programmable dimmer board. Through this equipment, 1-, 3/4-, and 1/2-inch videotape capabilities are provided as well as 1/2-inch format rough cut editing and final computer editing on 1-inch machines.

The recording studio contains analog and only a "hint" of digital recording equipment. According to Seawell, the DCPA limited its use of digital equipment because they "didn't want to make the investment in digital (equipment) until all the bugs were out." This audio recording equipment is complemented by various advanced acoustical design elements, including a "floating box design," which is a maple stripped and moveable ceiling panel that can be positioned to reflect or absorb sound; tracked acoustical curtains that can be run around the room's parameters; and a silent ventilation system.

—Constance Warren

## Jerrold contracts

*General Instrument division inks pacts for equipment, turnkey construction*

HATBORO, Pa.—The Jerrold Division of General Instrument has received an order from McCaw Cablevision Southern Oregon in Medford, Ore., for equipment worth approximately \$2.1 million.

Jerrold will supply McCaw Cablevision with approximately 24,000 DRZ Starcom 450 plain converters with handheld remote control units, more than 7,000 Starcom 450 digital addressable converters with remote control units, and an AH-1 addressable controller.

McCaw's Medford and Grant's Pass systems will receive the plain and addressable converters. The addressable controller will be located in Medford and linked to Grant's Pass via telephone line.

McCaw Cablevision is a subsidiary of McCaw Communications Inc. in Bellevue, Wash.

In an unrelated announcement, Jerrold

signed a \$2.36 million turnkey construction agreement with Westmoreland Cable Co. Jerrold will rebuild the Comcast Cable Communications subsidiary's 220 MHz system in New Kensington, Pa., and surrounding areas.

Construction plans include the replacement of 292 miles of existing single-trunk, single-feeder plant, which will operate at 450 MHz. Jerrold Starline JN 450 distribution products will be utilized.

## NewsSweep

■ Pico Products Inc. has announced net earnings of \$900,640 or 31 cents per share for its fiscal year ended July 31, 1983, compared to last year's figures of \$1,013,553 or 52 cents per share. Officials claimed that increased expenses related to its new OTAS addressable system and satellite reception businesses had depressed full year earnings.

■ AvTek Inc. has announced an agreement for Anixter Communications to distribute the AvTek Model 2901A Digital Time Domain Reflectometer, a unit used to locate opens and shorts in all types of metallic paired cable. Anixter-Microsat, Anixter Communications' Canadian distribution firm, will distribute the product in Canada.

■ Lolean Data Management has changed its name to Logical Data Management Inc. but will still use and be generally referred to as LDM Inc.

■ C-COR Electronics Inc. has announced that its board of directors has authorized the company to purchase up to 200,000 shares of common stock of the corporation in the open market.

■ Century III Electronics International Inc. has been selected by Continental Cable Chicago to supply feedforward trunk, bridger and line extender equipment for its Chicago Area 5 new-build. The 1,000-mile dual cable system will have a 450 MHz bandwidth with 30 dB operational gain.

■ Satellite Syndicated Systems Inc. has reported net income of \$895,000 for the third quarter ended Sept. 30, 1983, compared with \$459,000 for the same period last year. Earnings per share were 17 cents for the quarter, up from nine cents a year ago.

■ General Instrument Corp.'s Jerrold Division has announced that all Jerrold cable television electronics products are now covered by an extended warranty. The new coverage provides protection from defects in materials and workmanship under normal use and service for 12 months, including the full range of Subscriber and Distribution product lines.

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DX also provides the DSA-541 Block Downconverter. It features a highly stable ceramic resonator, with a fixed frequency of



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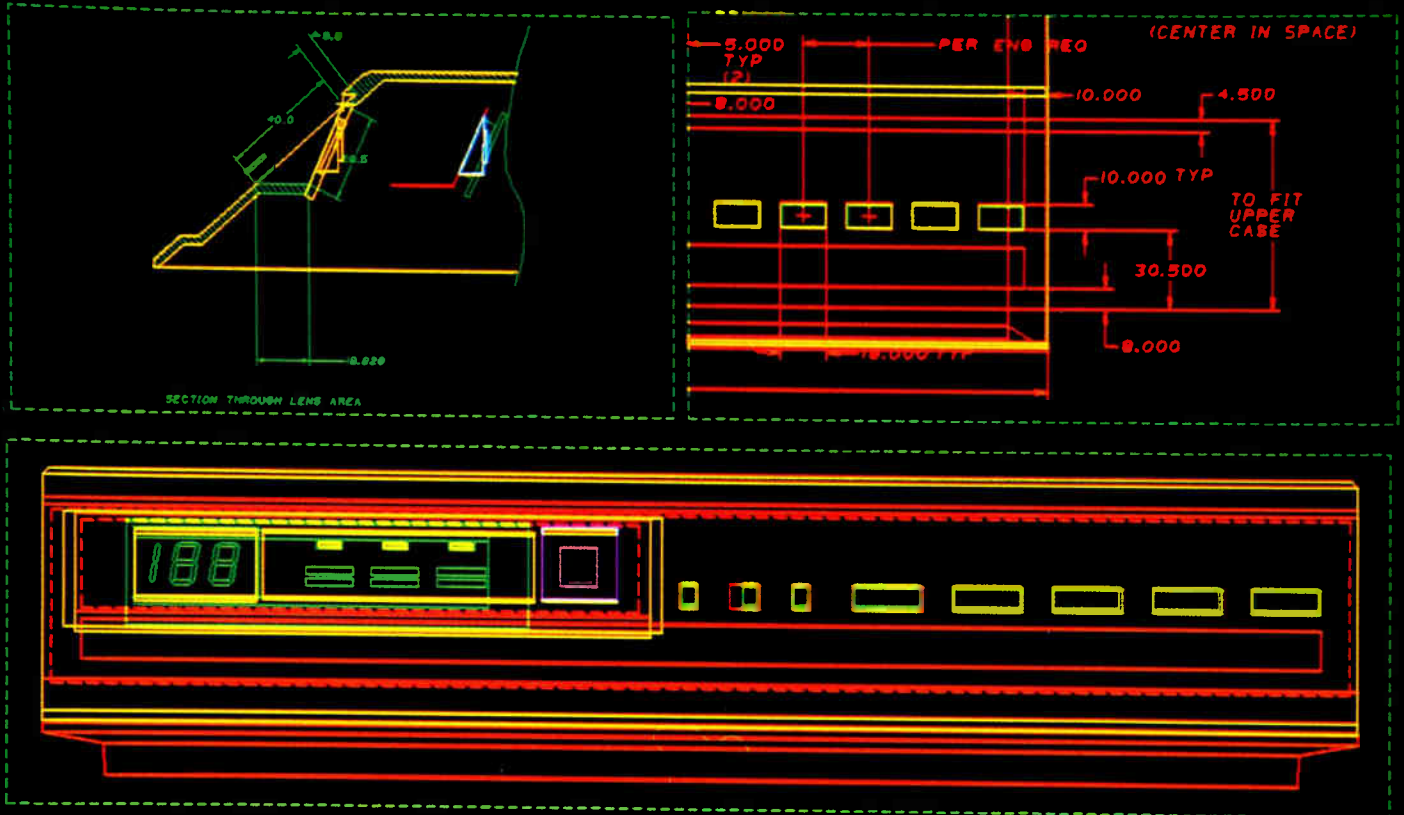
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# Knight-Ridder launches Viewtron

Commercial videotex service debuts in South Florida

By Gary Kim

It isn't quite time to tell Gutenberg goodbye, but it may be time to say "move over." The publishing industry has been abuzz with talk about videotex for the past two years, and on Oct. 30 Knight-Ridder Newspapers Inc. played midwife to the infant electronic publishing industry by launching the nation's first commercial videotex service.

Called Viewtron, the system brings subscribers in the Miami-Fort Lauderdale area news and information, shopping and banking services through their television sets. Knight-Ridder's Viewdata Corp. is targeting 180,000 homes and will settle for 5,000 subscribers by the end of the first year, according to Dan Smigrod, marketing coordinator. The experiment will be closely watched by the 100 or so companies whose interest in electronic publishing has led them to pour more than \$100 million into the new information delivery systems.

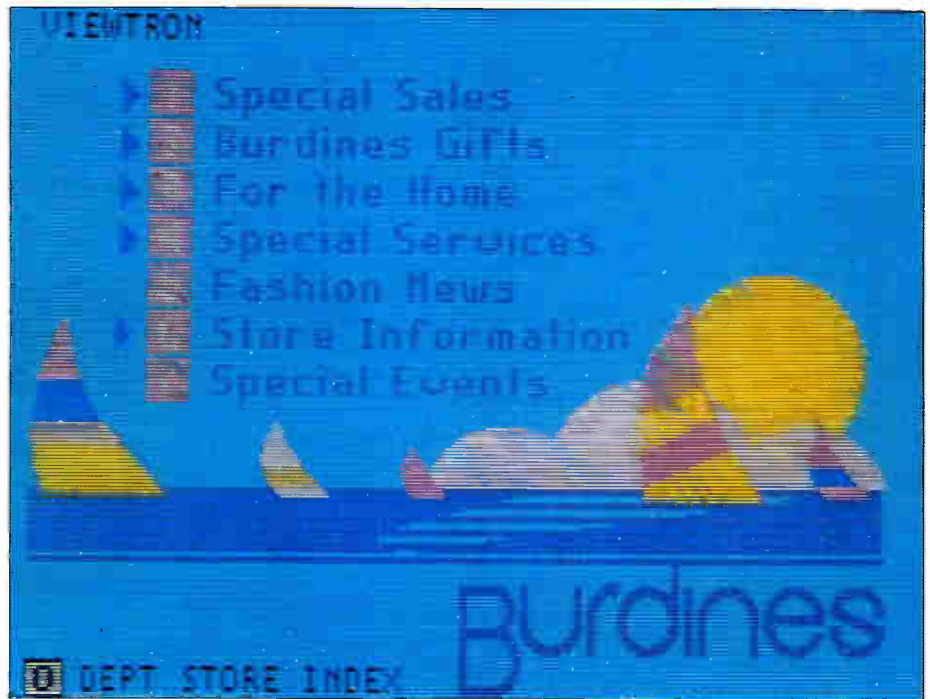
Viewdata Corp. is confident that customers will pay \$12 a month for the home information service, plus typical telecommunication costs of \$15 a month. In addition, Viewtron customers must purchase an AT&T-manufactured "Sceptre" terminal, which connects the home television and telephone with the Viewdata computer.

The terminal sells for \$900, although a limited number are available at \$600. So far, "the biggest problem is keeping product in the store," Smigrod said.

The big question is whether consumers will prove as willing to pay for information as business executives.

The overwhelming share of electronically published information is currently delivered on dedicated terminals. Business is the major customer, buying nearly \$1 billion worth of information a year. Librarians, scientists, lawyers and doctors have access to computerized indexing services to speed their research. Securities traders use Quotron Systems terminals and Bunker Ramo Information Systems to obtain up-to-the-minute stock, bond and commodity prices. Credit rating agencies like Dun & Bradstreet supply banks and other lenders with terminals which access credit files.

Dow Jones currently has 85,000 subscribers who pay rates ranging from \$12



Electronic shopping is available via Viewtron.

a month to \$1.20 per minute to use the company's News Retrieval Service. But at the moment, no hard data exists which indicates that consumers will plug into a videotex service when they can go to the corner store and pick up a newspaper for a quarter. For that reason, most would-be electronic publishers are anxiously watching to see how quickly Knight-Ridder can sign customers.

Some 150 companies selling everything from flowers to cameras and travel to clothing have signed up to advertise on Knight-Ridder's new service, while 50 information providers have developed data bases on more than 750 topics. Besides local and national news, subscribers can pay bills through a dozen local banks. J.C. Penny Co. computers are connected to Knight-Ridder's so that items in the catalog can be ordered electronically.

Viewers also can program a "personal magazine," which is electronically assembled each morning according to topics chosen by the viewer. Subscribers can also send messages to other Viewtron users.

Long-term, Knight-Ridder aims to become a major videotex deliverer in metropolitan areas around the country. In essence, the company plans to offer

"turnkey" operations for local newspapers and cable companies. Viewtron's South Florida programming is a model for what the firm hopes to offer across the nation.

News, weather and sports are provided by The Associated Press, Dow Jones & Co., the *Miami Herald*, *New York Times* and other news services. Viewdata also is touting the availability of "micronews," stories usually considered too insignificant to be carried in a major metropolitan daily. Little League scores and church news are examples of "micronews." Other specialized news services include neighborhood calendars, weekly price surveys of products offered by Dade County businesses and local real estate listings.

Educational services include the entire Academic American Encyclopedia, reading and mathematics skills lessons, Spanish and computer literacy instruction. Viewtron also provides at-home shopping, banking, investment advice, travel information and electronic mail.

Knight-Ridder isn't the only player jumping on the videotex bandwagon. Times Mirror Co.'s Videotex America subsidiary also plans a mid-1984 launch of its text operation in Orange County, Calif. Called "Gateway," the service is a joint venture with Canada's Infomart, a

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subsidiary of that country's two largest publishing and communication companies: Torstar and Southam Inc.

Gateway will feature a data base of some 50,000 pages of information and will cost consumers about \$30 a month, according to Penny Welsch, marketing communications manager for the firm. Like Viewtron, Gateway will use the Sceptre terminal, rental of which is included in the \$30 monthly charge.

Unlike the Knight-Ridder service, however, access to all data bases is possible without payment of additional telecommunication charges.

Times Mirror concluded a nine-month test of its service last December. Some 350 participants in Palos Verdes and Mission Viejo, Calif., were offered a data base containing more than 70,000

pages of information. The home banking, shopping, news, ticket purchasing and other services were delivered by telephone line to 200 houses, and by cable television lines to 150 houses.

Times Mirror officials are following the Knight-Ridder operation "closely," and are planning for Videotex America service in at least 15 cities.

The company also plans to offer commercial videotex in addition to the consumer-oriented Gateway. In October, the firm announced the formation of a joint venture to operate Grassroots California. The new service will offer the state's agribusiness industry weather reports, news, commodity prices and related information. Videotex America's partners in the venture are McClatchy Newspapers and TBC, Inc. **CED**

billion to accrue from data transmission but considers ancillary services as an opportunity for operators to glean additional revenues.

Given these fortuitous indicators, why then has cable been so slow in implementing data and ancillary services? McCarthy says the answer is manifold: operators have been overwhelmed with the day-to-day problems of churn, illegal connects and theft; and cable's maturation as "a non-value added service industry has not really challenged (the operator) to provide innovative programming in innovative ways."

What is needed to spark cable's interest in these markets, McCarthy continues, is a forerunner. Once "word is out," he believes other operators "will avail themselves of these opportunities."

McCarthy considers both security and metering as profit-producing, no-risk opportunities that the operator can exploit today. Electronic banking, however, he dismisses as too risky. "Electronic banking is a big question," he says, "involving the operator in some sort of judiciary relationship in the electronic transferring of funds." Other complications arise, he elaborates, when the issues of confidentiality and security—which must be assured during the transfer of funds—are taken into consideration.

Operators, though, can offer security today. The hardware is currently available and is not difficult to install. The system McCarthy described entailed the placement of a panel within the home and an addressable converter on the pole. The panel should contain output and input devices capable of handling a variety of services. In this way, the system can be upgraded into an overall surveillance system, providing intrusion, medical and fire alert along with energy load management and metering. McCarthy cited E-COM's CSM product as one internal security system that can be upgraded. He also identified a number of off-premise converters, which he favors over in-home converters because "the equipment is too expensive and intelligent" to jeopardize its security by placing it within the home.

The major advantage McCarthy recognized that cable security offers over telephone security is that "it monitors by exception." This means that the cable system, through the use of polling technology, can detect and identify a system failure or malfunction almost immediately. (Some systems can poll 15,000 subscribers every eight seconds.) The telephone system does not possess this capability. If an intruder were to cut the phone lines and thereby deactivate the alarm system, the phone company

## Ancillary services: the emergence begins

*Home security, electronic fund transfer, meter reading are developing amidst data transmission dispute*

**By Constance Warren**

Cable's ancillary services have maintained a low profile and secured a modicum of anonymity amidst the mounting data transmission dispute. This anonymity has enabled operators interested in offering these services—i.e. security, electronic banking and energy load management—to proceed with their plans relatively unhindered.

Ever since data first was hailed as a revolutionary new business opportunity for cable, local public utility commissions, BOCs and even AT&T itself have contested cable's emergence into this field. Together, these entities have instigated various legal measures calling for the subjugation of cable's data services to common carrier status and the regulation of operators providing these services as public utilities. Now, with the imminent divestiture of AT&T, these battles promise to intensify as BOCs launch final efforts to prevent operators from entering a market they have pegged for themselves.

Equipment failures and technological pitfalls represent a second major obstacle that has impeded cable's delivery of data services. Operators supplying ancillary services have not been left unscathed by this difficulty, since transmission of ancillary services requires the use of the same two-way interactive equipment as is utilized for conveying data. Recently, though, these

hardware bugs have been detected and remedied.

Brian McCarthy, president of The High Technology Group, a New Canaan, Conn., consulting firm specializing in telecommunications, computers and cable, believes data and ancillary services offer a tremendous, untapped source of revenue for cable companies. But, he stressed, cable's entrance into this burgeoning field may be pre-empted by local BOCs and AT&T itself, and "cable operators may miss the boat if they don't respond aggressively and intelligently to these new opportunities."

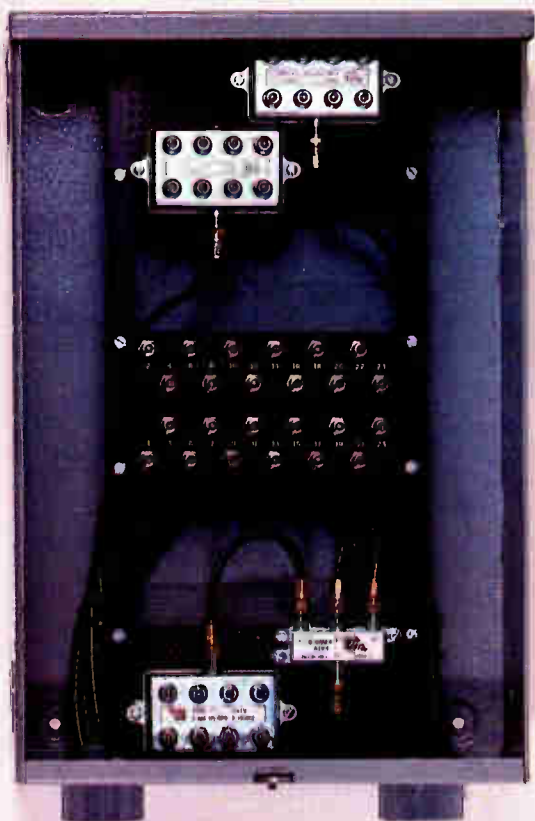
In fact, data and ancillary services offer more potential to cable operators than to telephone companies, McCarthy explains, because coaxial cable is a far superior medium for transmitting data than twisted pair lines. This superiority is realized on a number of fronts. Specifically, cable offers greater bandwidth (300-450 MHz as compared to the telephone's 3 KHz), faster transmission, lower bit error rates (BER) and more reliability.

The most compelling reason for operators to enter these markets, McCarthy says, is revenue. Forecasts project the international telecommunications industry to burgeon into an \$88 billion market by 1990. Out of this \$88 billion, cable's share is estimated at \$10 billion. McCarthy expects most of this \$10

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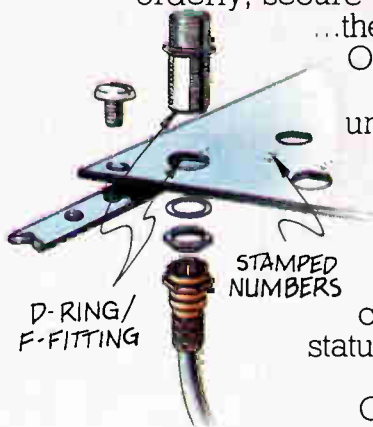
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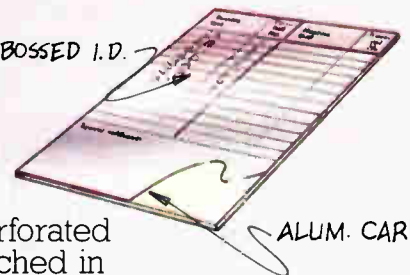
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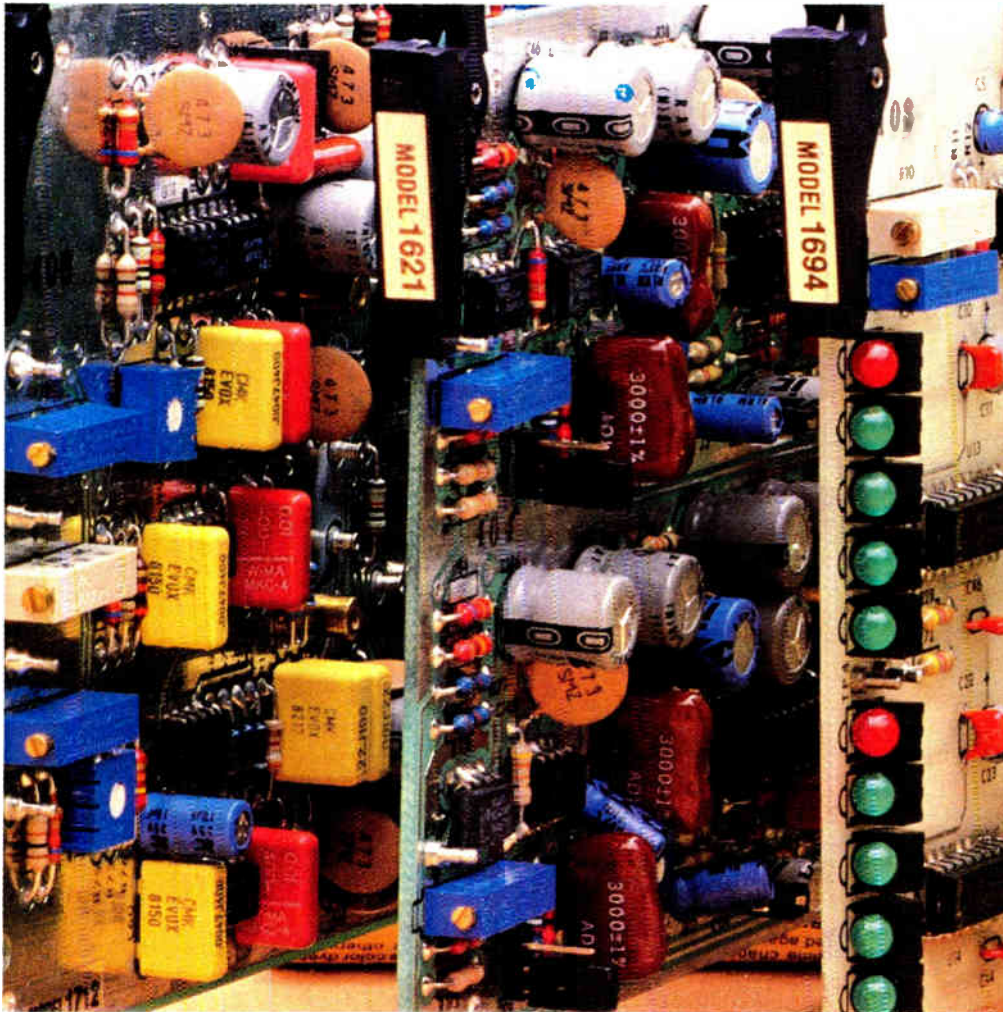
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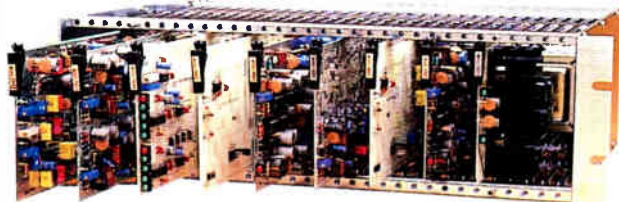
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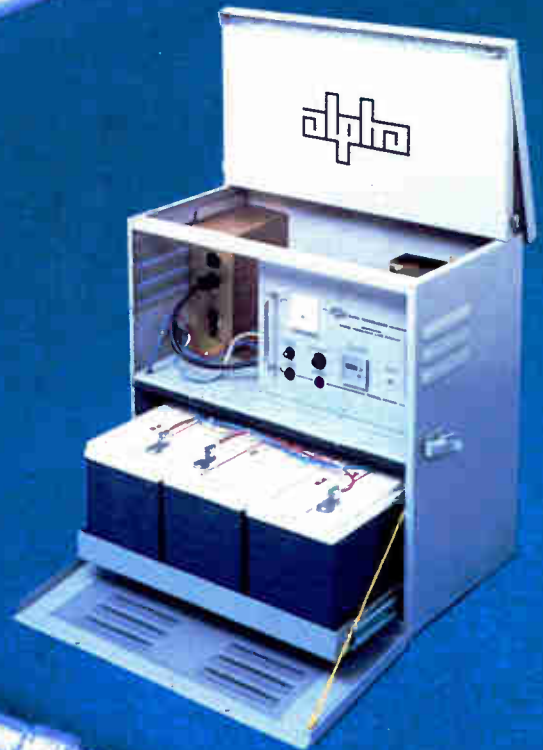
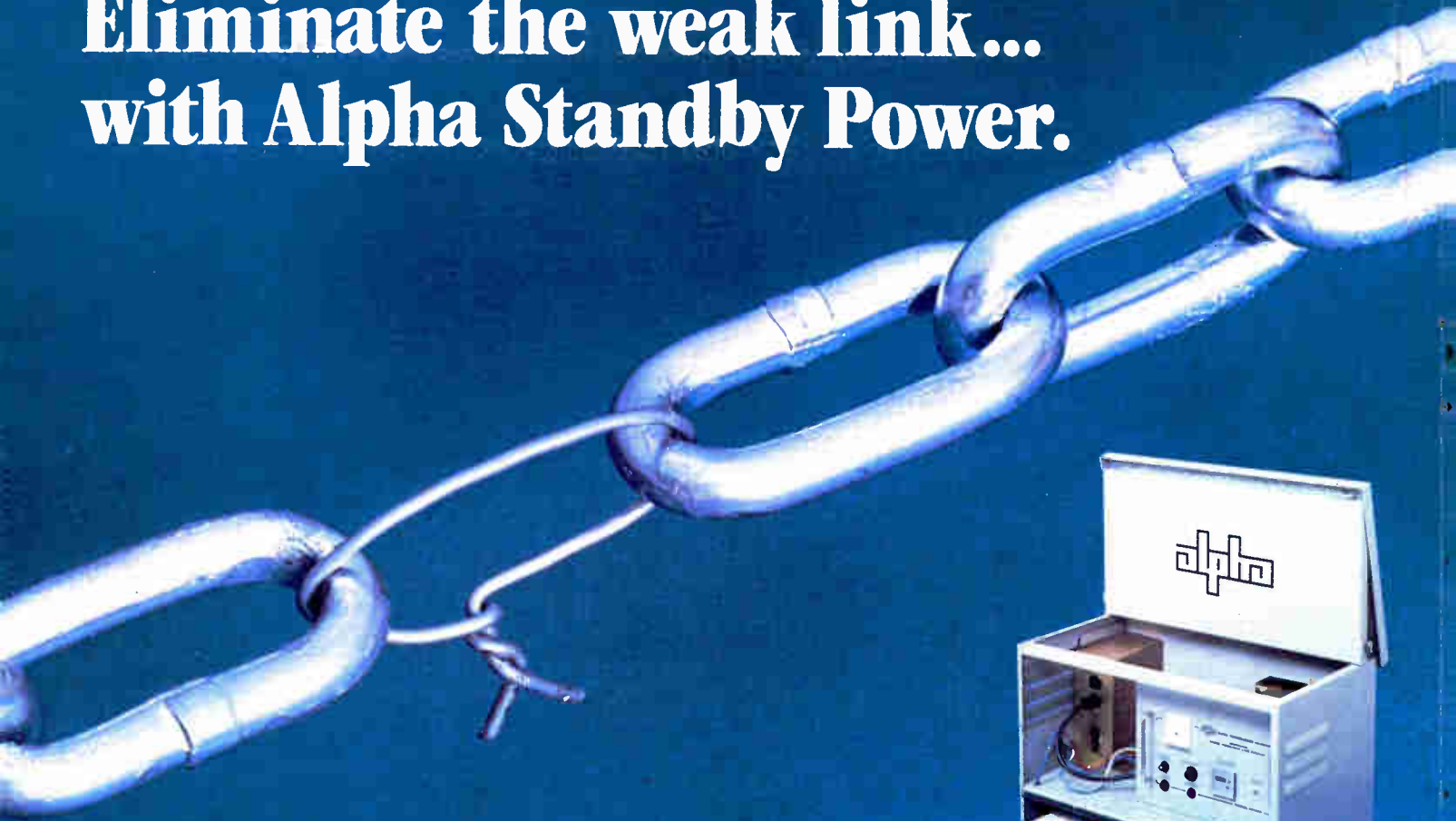
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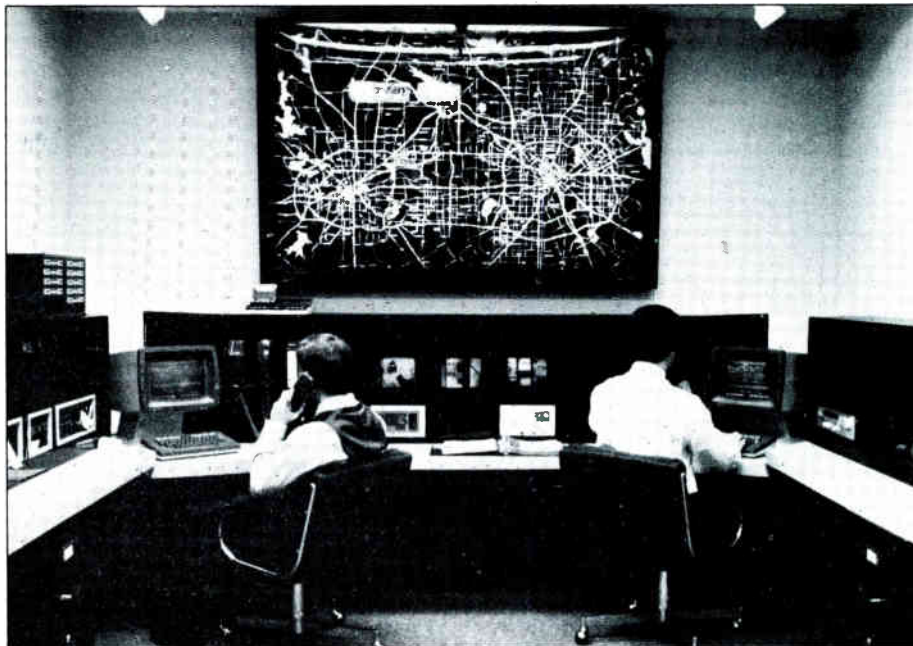
## COVER STORY

would not be cognizant of anything wrong in the system, unless, of course, the subscriber were to inform the phone company of the situation.

Jim Smith, president of Cableguard Systems, a Plano, Texas, firm offering cable-security services, concurs with most of McCarthy's views. He does, however contest one point. "Security is not a business for the cable operator," he argues.

Smith bases his argument on the cable operator's history as a purveyor of entertainment services, with limited experience in specialized sales. "Security," Smith contends, "is a very specialized one-on-one sale, entailing an \$800-\$1,200 sale in the home." It also is "smaller in numbers" than that which the operator is accustomed. Other dissuasive factors are the capital expenditures and revenues involved.

A company that is not an operator, Smith claims, can circumvent these problems. First of all, it can develop a sales force trained exclusively in the product. Secondly, it can boost revenues and limit costs by using one monitoring station to provide security to subscribers in adjacent cable systems. Since the monitoring station is the biggest cost incurred in the implementation of the



**Cableguard Inc.'s Dallas/Fort Worth Monitoring Center, located in Dallas, services over 50 cities and encompasses nearly half a million total homes.**

service, Smith continues, a company that is not an operator can spread the station's cost over a number of cable systems and among more subscribers than the operator.

Currently, Cableguard offers security in San Antonio, Dallas/Fort Worth and Park Cities, Texas; Omaha, Neb.; Tucson, Ariz.; and San Francisco. The company also expects to begin operations in

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# Jackson Enterprises

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## COVER STORY

Cox's New Orleans system by the end of the year and to realize profits on the Dallas and San Antonio systems by that date.

A typical Cableguard system employs cable as the conduit with phone line redundancy. (In those instances where the cable network has not been upgraded to two-way, phone lines are used exclusively.) The company is using the TOCOM HAT system, which "digitally talks to the computer at the cable headend," in the San Antonio system and Scientific-Atlanta equipment in Cox's Tucson system. The company chose to use two manufacturers, according to Smith, because it felt it "was healthier to have more than one vendor."

The basic Cableguard fire, intrusion and medical alert package includes three openings with an inside trap, smoke/heat detectors, medical buttons, intrusion alarms and a back-up power supply. A polling procedure that sends the signal down the distribution network on a "digital" channel near the FM frequency" is utilized. This signal returns to the headend on a channel below the CB frequency, "somewhere in the T-10 area," and then is relayed to the central monitoring station.

While Smith is optimistic that security

soon will develop into a revenue-producing field and believes "cable is the superior medium for conveying these services," he thinks metering and energy load management are "blue sky," "not good economics" and impractical, at least for the moment. "No one is interested in having all their meters read," he says. Smith blames this apathy on "there being no incentive for the homeowner to spread energy use" and no utility interest in metering, which together translate into "there being no incentive for us to manage the load." Since the cost of installing the equipment necessary to meter runs around \$300-\$500 per home, he assumes "metering probably won't be viable for some time. It's going to be a while before you see cable operators entering the market," he adds.

Cox Cable is one of the MSOs with which Cableguard has an agreement to provide cable security services. Prior to this agreement, Cox had been offering security via phone lines to 600 accounts in its Omaha, Neb., system. But, according to David Nicholas, former director of security and present director of loss prevention at Cox, the operator "never had been actively involved in security in any franchise."

Nicholas says Cox's withdrawal from the security field was prompted by its recognition that "it wasn't close enough to the business" to effectively provide the service. Other factors instrumental in its decision to abandon the project were that the services wouldn't become financially viable for two-and-a-half years and that security "was going to be a small business with a potential down side." In fact, Nicholas candidly admitted, "the franchise commitment was the only reason it (Cox) got into it (security)" in the first place.

The agreement Cox reached with Cableguard relieved the operator from the onus of having to fulfill its franchise commitment itself. Cox chose Cableguard over other contenders, according to Nicholas, because "there wasn't much competition" and because Cableguard had "hands-on experience" in cable security. Under the terms of the agreement, Cableguard will supply security services to three Cox systems: the Omaha, Neb.; Tucson, Ariz.; and New Orleans operations.

Nicholas doesn't recognize any significant advantage cable holds over telcos with respect to the provision of security. "The telephone system is just as reliable, if not more so," he said. One of the



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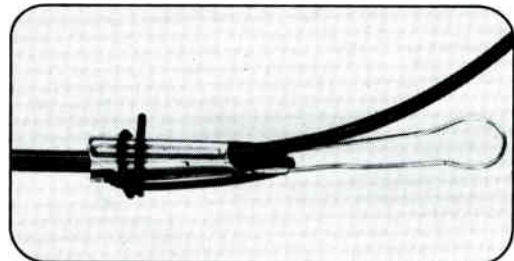
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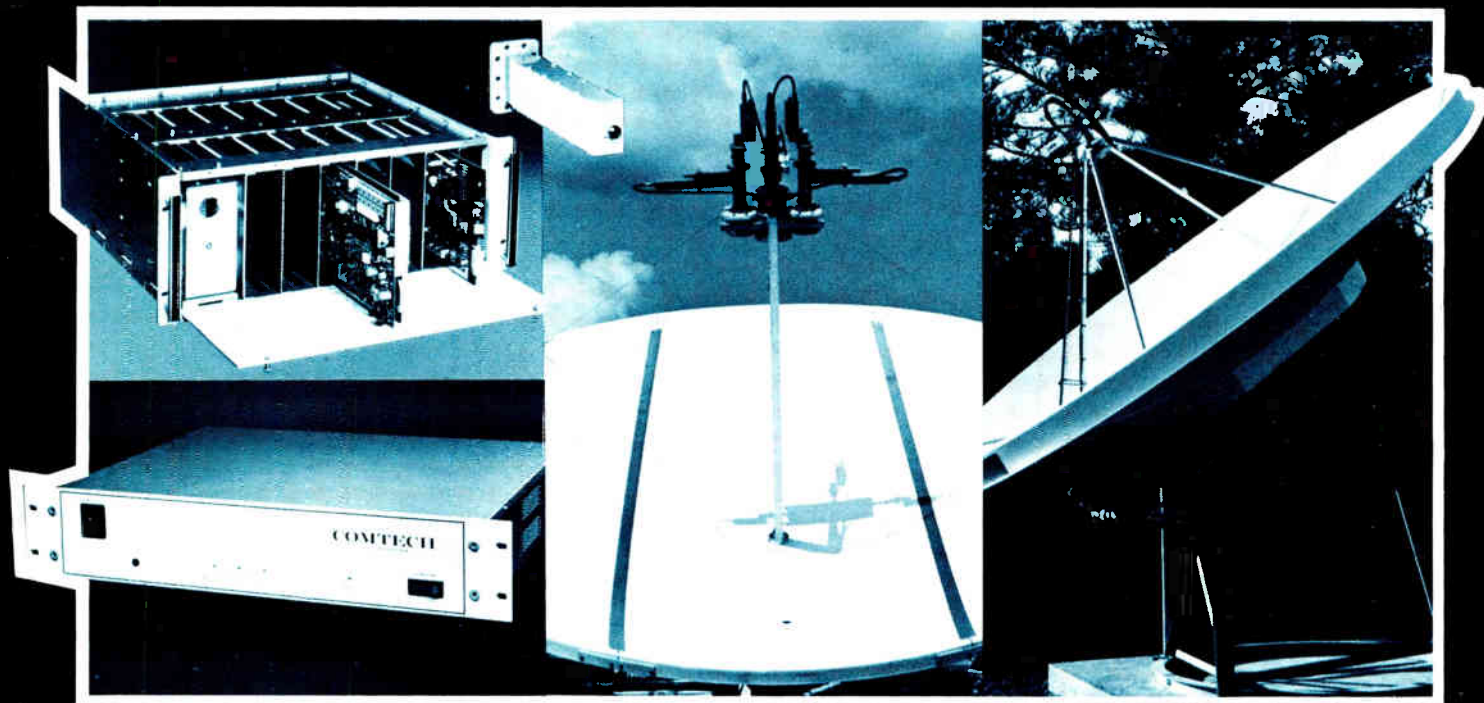
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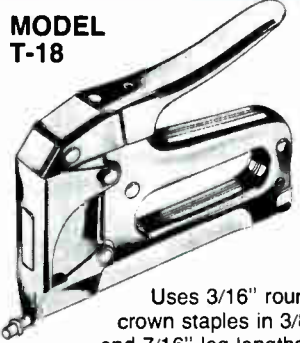
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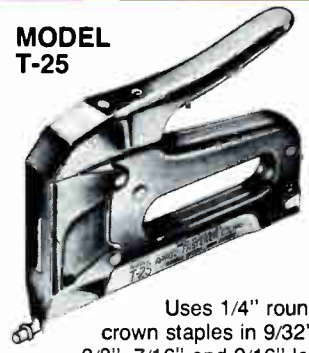
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## COVER STORY

major problems the cable company confronts in supplying these services, he explains, is keeping the plant operational 24 hours a day, seven days a week. So far, Nicholas believes Cableguard has been able to offer security through Cox's Omaha distribution plant virtually trouble-free.

Another difficulty the operator experiences is "manpower," since implementation of the service requires a whole new crew of installers, sales and marketing people. The operator also has a need for the "best, direct sales people you can find," because security is the "hardest" of sales.

Nicholas labeled metering and energy load management as "theoretical services, (which are) a number of years away." He said interest in the services wasn't sufficient to warrant "putting drops into every home just for the power company." He referred to videotex and other types of ancillary services as "all ahead of their time" and anticipates these services won't become viable "until the current younger generation growing up with video games gets to the 35-40 age group, with kids of their own."

Despite HomServ's exit from Cox's banking program, David Woodrow, director of new business development for Cox, is more bullish on cable's ancillary services than his Cox compatriot. He cites test results from an electronic banking trial currently underway in San Diego and the interest expressed in the real banking services offered there last year as proof that a market for electronic banking exists. He qualifies this remark, however: "Home banking is an unexciting and uninteresting business by itself." It becomes attractive, he adds, when properly packaged with a collection of other interactive services. Cox's electronic banking more than likely will provide a "broad array of financial services," in addition to typical banking transaction products.

While the actual configuration of the electronic banking network has not yet been determined, Cox plans to back up the system with phone-line redundancy. Thus, in case of a power outage, the subscriber still will be able to utilize the service. Subscriber terminals, equipped with local memory, and the host terminal, which monitors transaction activity, will ensure transactions are not lost and will inform the subscriber if the transaction is not concluded.

Woodrow expects Cox to "commercially deploy" electronic banking services in the fourth quarter of 1984 or early 1985. The service will be the end product of an effort undertaken by Cox,

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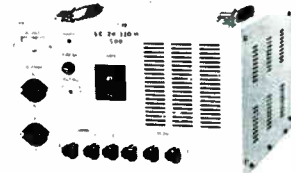
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The Communicom terminal to be supplied by Jerrold has been under development for two years and is a second generation product that Jerrold officials describe as "the first totally software downloadable terminal in the market. It is unique in that it combines videotex and video entertainment in a single terminal." Its software downloadable feature means that it is flexible enough to receive different software programs sent through the cable distribution network.

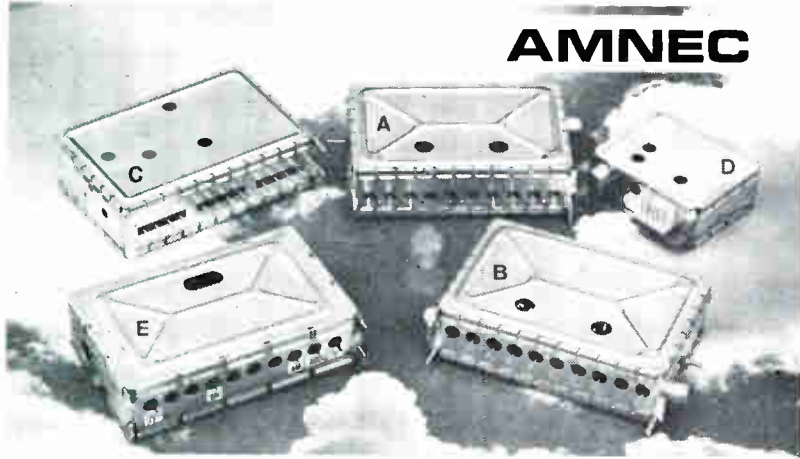
Cox has not concluded any contractual agreement with financial institutions yet, although discussions are underway. Woodrow expects Cox to treat these institutions as "information providers" and for the agreements to involve Cox with both local and national financial institutions.

While he would not disclose the firms with which Cox is conferring nor those systems that probably will be the first to offer the banking services, he estimates the cost of the service per subscriber at \$15-\$20 per month. A one-time installation cost which may be waived, would be assessed on a case-by-case basis.

Among the two camps divided over who is the best provider of cable security, Miklos Korodi, president of Warner Amex Security Systems, sides with McCarthy. He calls Smith's argument that security is not the operator's business "untrue." According to Korodi, "a cable company can develop a proprietary security system, achieve high retention, provide an excellent service and be profitable," all at the same time. Pointing to Warner Amex's QUBE systems as examples, he exclaims: "We have done it. This year we grew 70 percent."

Warner Amex currently provides security to 12,500 customers in five systems: Columbus, Ohio; Cincinnati; St. Louis; Dallas; and Houston. Once implemented, he estimates it takes two and a half years for the service to realize a profit. Korodi says the Columbus and Cincinnati systems are turning profits.

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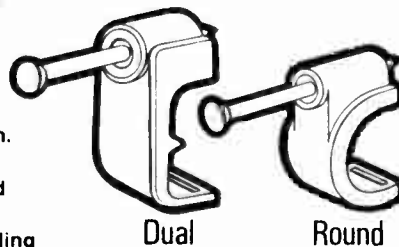
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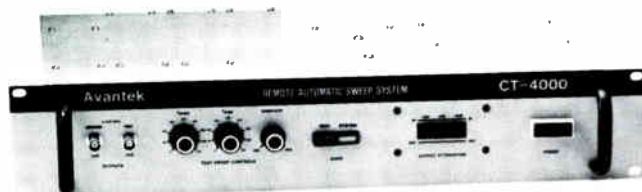
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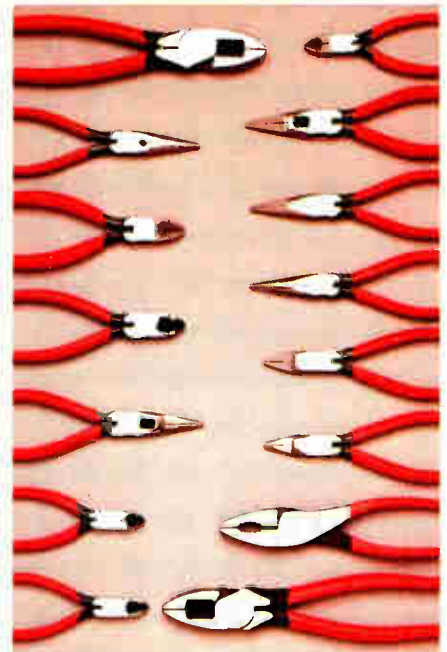
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## COVER STORY

The profitability of the service, he continues, depends on one crucial variable: the customer. "The customer is the prime factor determining who's going to succeed," he says. The company supplying the service, however, can influence the customer's decision by providing an "excellent product and service." So far, Warner Amex Security has received "less than 1 percent in customer complaints from security subscribers," he adds.

Warner Amex QUBE systems use a "bilingual system," which means that the terminal in the headend can communicate with cable, but has the capability, if there is an outage, to send the signal over the telephone line. A cellular alarm system is used along with a master panel patented by Warner Amex and manufactured by DTI, a UL/FCC approved terminal; Data General computers located at the QUBE site; Pioneer modems; and software developed by Warner Amex. Together, these components provide a basic security package that includes burglar, fire, emergency/medical and duress alarms. The subscriber pays a one-time fee of \$1,250 and a monthly fee ranging between \$16.50-\$18.50, depending on the sophistication of his service.



Miklos Korodi

Korodi also disagrees with Smith on one other point. He does not believe cable is the superior medium for conveying these services. "Absolutely not," he argues, "unless you have redundancy. Outages can be a major factor in losing your customers, and cable has more outages than the phone system because it is not a switched network." He is certain that cable can provide an excellent product, though, if the operator listens and responds to the subscriber,

offers good supportive service and backs up the system with phone-line redundancy. Korodi attributes Warner Amex Security's success to the quality of the service it provides its customers. "We give them good service; they see it and buy it," he concludes.

Korodi says "the hardware is there" to implement electronic banking, metering and energy load management services. When asked why Warner hasn't gone ahead and introduced the services, he responds: "Business is simple; people are very complex. The customer dictates when the service goes on-line." While there has been a lot of dialog at Warner focusing on meter reading, Korodi says he doesn't think metering is "economical at the present day," principally because subscribers haven't shown enough interest in the services yet. Once "the subscriber sees it (the services) as a need, sees its benefits and will pay for it, then we'll offer it," he underlines.

Warner Amex Security, however, is planning to test one or two non-entertainment services during the upcoming year. Korodi wouldn't discuss any details but did indicate that it will be the subscriber who dictates whether these services go on-line. **CED**



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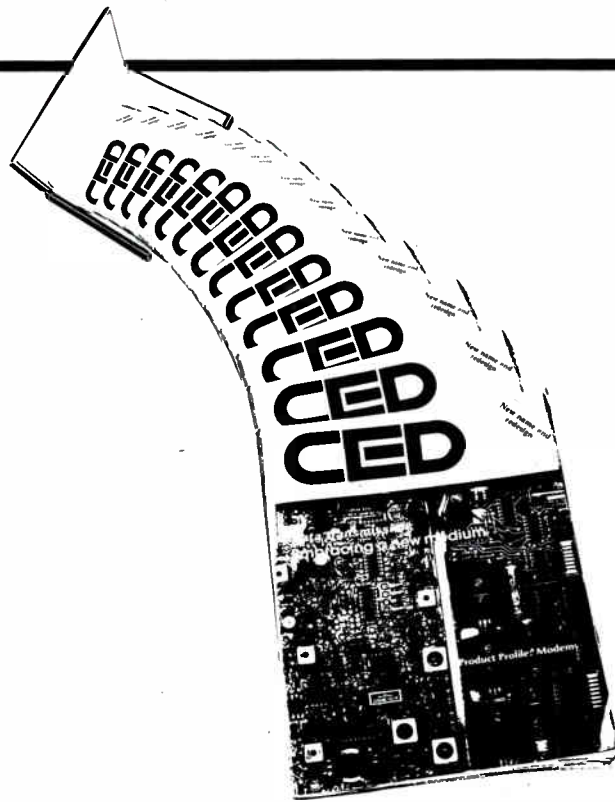
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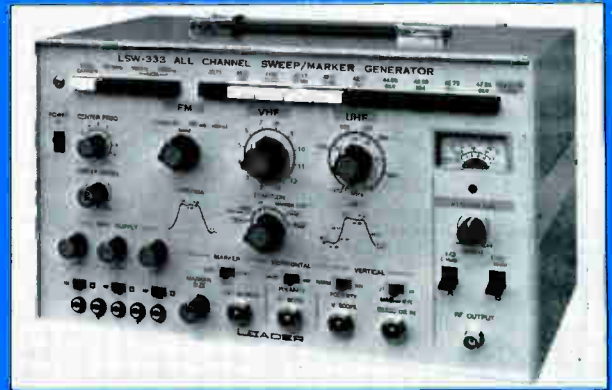
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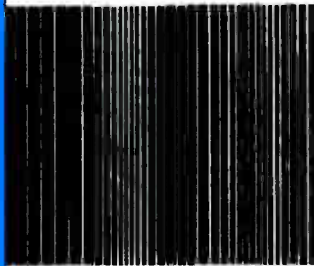
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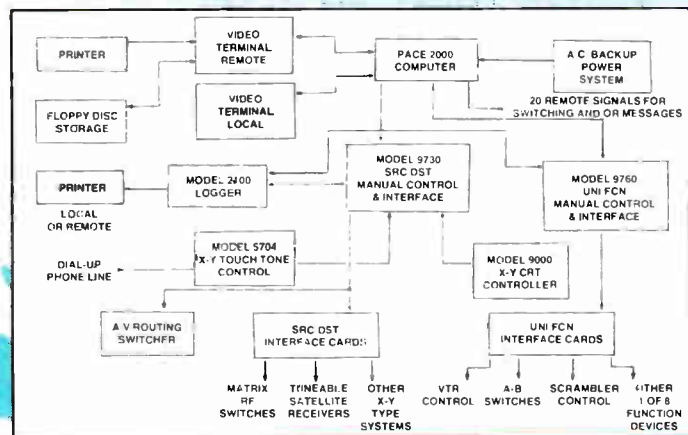
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# di-tech

Reader Service Number 41



# The bi-directional coupler

*An improved Test Point for broadband equipment*

By Joseph Preschutti,  
Vice President of Engineering,  
C-COR Electronics Inc.

Any broadband distribution system engineer who has worked with "pre-two-way" gear understands and appreciates the pleasures of working on a system that utilizes built-in directional couplers as test points. These devices consistently provide an accurate means of measuring system gain, flatness, signal strength, etc. and ignore any minor reflections that are a normal occurrence of the system. The advent of two-way systems—and thus the requirement to monitor signals flowing in the reverse direction as well as in the forward system—saw the departure of the directional coupler from the test point scene and with it, a departure of accuracy in swept measurements.

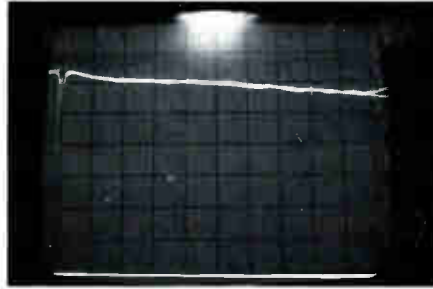
The result of this loss of accuracy is an increase in system maintenance costs and a decrease in reliability of the system. The system technician is responsible for system flatness and, when sweep balancing, must adjust controls to counteract trunkline flatness perturbations.

Unfortunately, if the test point lies, we end up solving problems that do not exist. Consequently, the technician might "tweak" the response of the trunk to get his test point flat while actually degrading the performance of the system. This inaccuracy can be quite substantial as shown by the following examples.

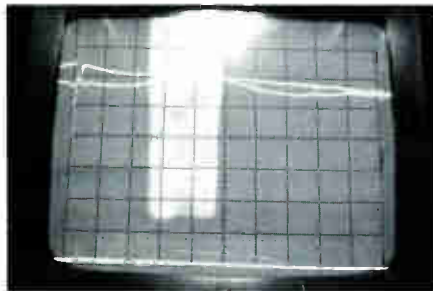
Figures 1 through 4 show several test point responses that are intended to illustrate the problems associated with test points that simultaneously measure signals traveling in either direction on the system. These photographs were taken with a voltage transformer test point, but a similar response would be obtained with a resistive test point, a current transformer, or a test point probe.

First, for a reference, the swept response of a 5 to 500 MHz test point is shown in Figure 1. Here a very good accuracy is achieved, but the test point is being tested under laboratory conditions (return loss greater than 30 dB is being used). This test point shows a response flatness within 0.1 dB of the desired -20 dB value assigned to the test point. This good response is the natural and practical condition for factory and bench tests.

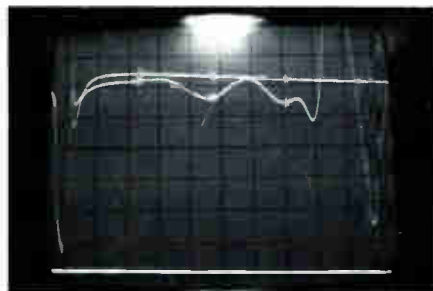
However, actual operating conditions



**Figure 1**  
*Swept response of a standard test point with a good 75 ohm termination. (0.1 dB Peak-to-Valley)*



**Figure 2**  
*Standard test point when a DC-8 is close coupled to the housing. (0.7 dB Peak-to-Valley)*



**Figure 3**  
*Standard test point showing reverse input response in sub-split equipment. (1.2 dB Peak-to-Valley)*



**Figure 4**  
*Standard test point showing reverse input response in high-split equipment. (1.7 dB Peak-to-Valley)*

can greatly affect the situation, as shown in the next three figures. These are more practical circumstances and do indicate the problem with the non-directional test point. Figure 2 shows the same test point with a directional coupler having 22 dB return loss close-coupled to the trunk housing. This test point has a 0.7 dB flatness error.

Similar flatness problems exist for attempts to monitor the strength of incoming signals. This is exhibited by Figures 3 and 4, which depict the response of the test point for the return portion of a sub-split and split-band amplifier respectively. In these cases, the amplifier return loss of 18 dB causes reflections that affect test point response. Of particular interest is the very wild excursion from desired response in the guard band of the diplex filters where return loss approaches very poor values.

These false readings can fool the unsophisticated system maintenance technician who might attempt to correct what appears to be a system problem by adjusting the actual response of the amplifier. Further, this type of test point accuracy has a subjective effect on the perceived quality of the equipment and the system.

## Why are conditions tolerated?

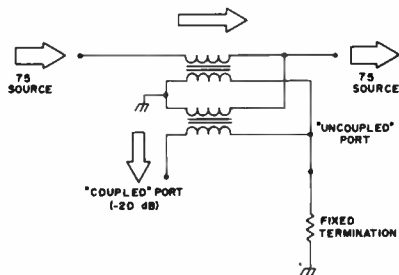
The foregoing test point inaccuracies are universal problems throughout the broadband industry. It is true that a directional test point would eliminate these problems, but they have not been used to date. There are several reasons for this situation:

### Insertion loss too high

- Directional couplers only monitor signals flowing in one direction. Because of this, two directional couplers would have to be used to monitor signals flowing in both directions. Since the loss of a directional coupler is about 0.5 dB, for this application, it might require a total of 2.0 dB insertion loss to monitor signals flowing in either direction on both input and output test points of a trunk station. This loss is unacceptable, so directional couplers are not used in this manner.

### A probe is not practical

- A directional coupler requires that both current and voltage be monitored simultaneously. This feature allows



**Figure 5**

STANDARD DIRECTIONAL COUPLER CIRCUIT

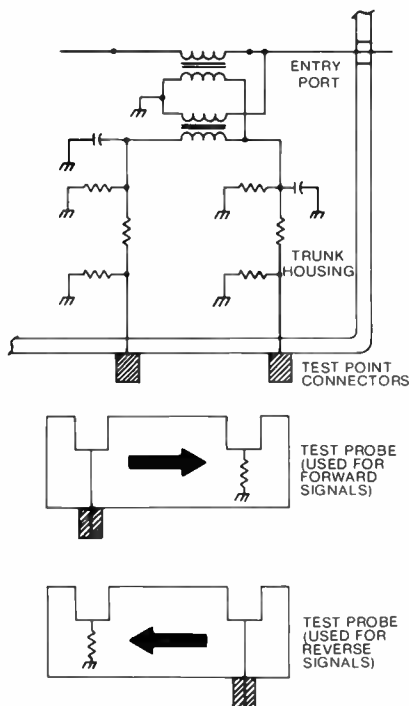
the directivity and isolation of the device to ignore reflections. In order to monitor current, it is necessary to break the signal path. A directional coupler schematic is shown in Figure 5.

Devising a probe that would allow momentary insertion of a directional coupler would be an unusual mechanical task. Furthermore, it could degrade the reliability of the trunkline by adding additional connectors to the signal path. This is not considered to be an adequate solution to the problem.

Typically, test point probes are relegated to the voltage transformer or resistive voltage divider types, which are non-directional.

### A solution to the problem

A unique test point circuit has been developed (patent pending), which solves the test point accuracy problem. The



**Figure 6**

circuitry inside the trunk station is a bi-directional coupler with two "test point" outputs. These outputs are connected through special padding circuits to both sides of the voltage transformer section of the coupler. A "standard" directional coupler would have one side of this transformer permanently terminated. This permanently terminated side is referred to as the "uncoupled" port. The other side of the transformer or "coupled" port would then indicate signal levels 20 dB below those flowing through the coupler in one direction. If the signal direction is reversed, then the roles "coupled" and "uncoupled" ports are interchanged. That is, the coupled port for forward signals is the uncoupled port for reverse signals, and vice versa.

The uniqueness of the circuit used in the C-COR trunk station is the method for ensuring the accuracy of both forward and return signal tests and the ability to remove the test equipment from the coupler without affecting the through flatness of the trunk station.

The improvement in test point accuracy is shown in Figures 7 through 10, which reveal conditions identical to those of Figures 1 through 4.

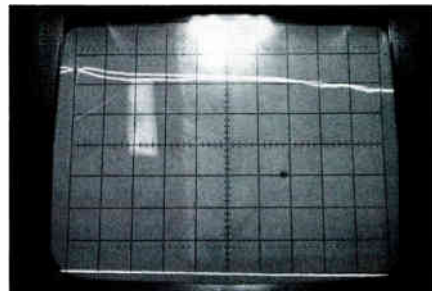
Note that with the bi-directional coupler, the test point accuracy is on the order of 0.1 dB in all cases. The reflections that are present do not affect the response of the test point. This is in direct contrast to the relative poor quality of the non-directional type test points.

The use of the bi-directional coupler test point requires terminating one of the two test point connectors while monitoring the other. Both connectors can be left terminated or unterminated without affecting the trunk response. To further simplify the use of the test point an optional accessory is available. This test point probe has two symmetrically placed input connectors and one output connector. On one side of the test probe there is a terminating resistor. The other side of the test probe is a direct feed-through to the technician's test equipment. A direction indicator arrow is provided on the probe to show whether forward or reverse signaling is being monitored. The test probe is shown functionally, schematically in Figure 6.

### Summary

A simple bi-directional test point solves a longstanding problem in broadband system requirement accuracy. This test point can be used with any test equipment with or without a test probe. A substantial improvement in ease and accuracy of swept measurements, with a

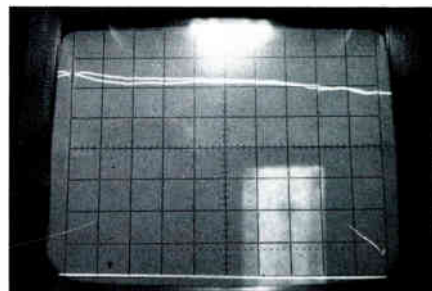
resulting improvement in system maintenance costs and reliability can be realized using this approach. **CED**



**Figure 7**

**Bi-Directional test point swept response, 5-500 MHz.**

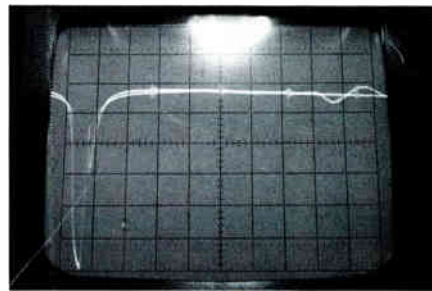
(0.1 dB Peak-to-Valley)



**Figure 8**

**Bi-Directional test point response with a DC-8 close coupled to the output.**

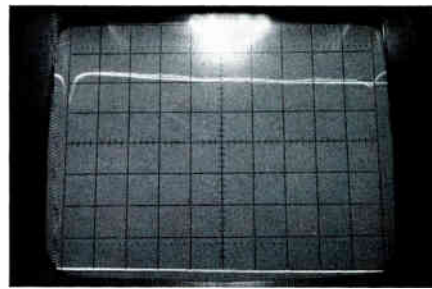
(0.1 dB Peak-to-Valley)



**Figure 9**

**Bi-Directional test point showing reverse input on sub-split gear.**

(0.1 dB Peak-to-Valley, 5-34 MHz)



**Figure 10**

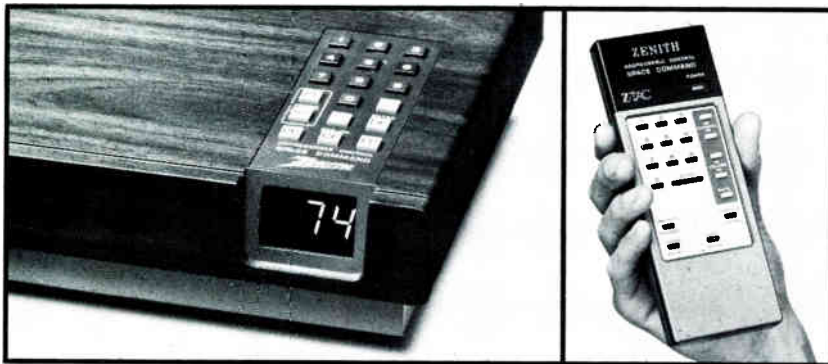
**Bi-Directional test point showing reverse input on high-split gear.**

(0.1 dB Peak-to-Valley, 5-200 MHz)

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# Product Profile

## CATV system sweep

Model	Frequency	Flatness	Sweep rate	Impedance
Texscan 9900D	4—450 MHz	(display) $\pm .25$ dB (max.) 5—330 MHz, $\pm .5$ dB (max.) 5—450 MHz	variable from .3 Hz—30 Hz	75 ohms
Texscan 9551T/9551R	center frequency can be set at any point between 4—450 MHz	better than $\pm .25$ dB at max. sweep width	N/A	75 ohms
Wavetek 1855/1865	1—400 MHz in 100 kHz steps	$\pm .25$ dB over entire range	1 ms—15 ms in 1 ms intervals	75 ohms

## Converter sweep

Model	Frequency	Sweep width	Sweep rate	Linearity
Leader LSW-345	VHF: 25 ~ 450 MHz; UHF: 445 ~ 925 MHz	$\pm 5$ —+30 MHz; variable	3 ms, power source synchronization (100/120 Hz for a single sweep)	within 5%
Wavetek 1405	8 programs of up to 99 channels each to a maximum of 240 different frequencies from 1—500 MHz; manual 1—500 MHz	switchable with 2 ranges, 1—50 MHz and 1-500 MHz, both ranges are continu- ously adjustable	50 or 60 Hz	better than 2%

## Bench sweep

Model	Frequency	Linearity	Sweep modes	Blanking	Impedance
Kay Elemetric 1250	50 kHz—1200 MHz	5% full sweep	N/A	switchable, vertical output returned to 0 ref. level	50 ohms
Texscan VS-60B	1 MHz—1000 MHz	.5% off full sweep width	line, 50/60 Hz; variable 5—60 MHz; variable .05—5 Hz; manual sweep; external sweep, CW	RF or video, selected by internal switch	50 ohms
Wavetek 1081	1—1000 MHz	1% at max. sweep width	recurring and single sweep	RF output is blanked during retrace	75 $\Omega$
Wavetek 1080	1 MHz—1 GHz	1% at max. sweep width	recurring and single sweep	RF output is blanked during retrace	50 ohms

Spurious signals	Sensitivity	Sweep width	RF output	Frequency accuracy
greater than 30 dB down	N/A	continuously adjustable from 200 kHz—450 MHz	+57 dBmV calibrated; 50 dB variable in 1 dB steps	N/A
at least 25 dB below fundamental output (30 dB typical) from 4—450 MHz @ 1.0V output	+10 dBmV sweep signal produces vertical deflection of at least full screen	3-step selector: 100, 200 and 450 MHz at any center frequency	(peak) at least 1.0V into 75 ohm load (+60 dBmV)	(dial) within 3% of unit's max. frequency at calibration marks
10—400 (450) MHz, 30 dB	-10—+60 dBmV	N/A	(amplitude) adjustable from +60—+50 dBmV in .1 dB increments	sweep or CW: 1% of swept band, $\pm 25$ kHz

Impedance	Spurious signals	Marker accuracy	Attenuation	Horizontal output voltage
VHF: 75 $\Omega$ , unbalanced; UHF: 50 $\Omega$ , unbalanced	less than -30 dB	(pulse) $\pm .5\%$ ; (birdy) $\pm 50$ kHz	0 ~ 63 dB, 1 dB step, programmed. 0 ~ 20 dB continuously variable, electronic	more than 10Vp-p (impedance 10 K $\Omega$ )
75 $\Omega$	N/A	(pulse type) $\pm .02\%$ (+25 kHz—0-Hz) (measured pulse leading edge)	continuously adjustable over 55 dB .35 dB in 5 dB steps plus 20 dB P.I.N. diode variable	approx. 18Vp-p triangle waveform (symmetrical above ground)

External marker	Sweep width	Flatness	Attenuation	Marker accuracy
input: provision for two at any frequency from 100 kHz—100 MHz. Input voltage-2 mv min. Amplitude continuously adjustable	1 dB	.5 dB	0-75 dB in 10 dB steps, 0-10 dB vernier	.005% for harmonic; .02% for variable
input is provided for coupling of external CW source to marker circuits to develop birdie markers	100 kHz—1000 MHz	$\pm .3$ dB	vernier: 0—6 dB; step attenuation: 0—80 dB, 1 dB steps	$\pm .005\%$
BNC input accepts CW signal for conversion to birdy marker. Input level must be at least 100 mV into 50 $\Omega$	200 kHz—1000 MHz; Full sweep: 1—1000 MHz	$\pm .25$ dB	continuously adjustable in 10 dB steps with an 11 vernier. Output level is displayed on a 3 digital read-out with 0.1 dB resolution	.005%
input accepts CW signal for conversion to marker	N/A	N/A	calibrated step attenuators allow the reference level and test traces to be superimposed, allowing for measurement of gain or loss at any frequency. Gain 79.9 dB when test channel is attenuated until traces meet. Loss is 65 dB, through attenuation of the reference channel. Resolution is .1 dB.	.0005%

## Return system set-up and maintenance (revisited)

By Jay Staiger,  
 Manager, Ampliflex Systems,  
 Magnavox CATV Systems, Inc.

The June 1983 issue of *CED* ran one of my articles that originally was titled "Return System Set-up and Maintenance." *CED* printed the article with the title "A Mathematical Trip Through The Return System Jungle." The article was written around the practical applications for present CATV return systems.

The September 1983 issue of *CED* carried an article by Harold Katz—"Examining Noise Factors." In his article, Katz challenged certain aspects of my paper.

In this present article, my response to Katz' response, I hope to shed light upon the different purposes of our two papers and to maintain and clarify some of my criticized concepts.

My paper in the June issue of *CED* was meant to relate practical considerations for implementing a CATV distribution system. Although my paper contained typical CATV distribution formulas, it was not intended as a Mathematical Trip Through The Return System Jungle as the title suggested. This title was apparently chosen by the *CED* editors before printing, and here is where the confusion lies.

Katz' response lays groundwork by deriving absolute power levels for thermal noise. I find no fault with his derivations. However, as normal procedure, the CATV engineer or technician work in terms of dB or dBmV. They do not work with absolute voltage, currents or power for the sake of simplicity. The practical CATV engineer will not apply Katz' formula to calculate the carrier-to-noise ratio in a CATV return system. Working in dB has been sufficiently accurate!

Katz' article in the September issue commented specifically on four points in my paper. I wish to address these points as they apply to his comments:

### Noise Figure

(reference p. 66)

The statement that noise figures are "the amount of thermal noise added

to the input noise of the amplifier is accurate as written in the following formula:

#### Calculation A

$$N = TN + G + NF$$

Where:

- TN = -59 dBmV and is the thermal noise level generated in 75 ohm load at 68° for approximately a 4 MHz bandwidth
- G = Gain of amplifier (dB)
- NF = Amplifier noise figure
- N = Noise level at the output of the amplifier

As the formula indicates, the noise figure is definitely added to the input noise in order to arrive at the output noise. Since we are working in dB, the definition, as given, is accurate.

### Return noise

Katz made the statement that it is "not appropriate to assign a noise figure to a return system." I disagree with this statement because the return system, in its entirety, can be considered to be a black box with an input and an output, just as a single amplifier can be considered a black box (as it normally is). If an amplifier

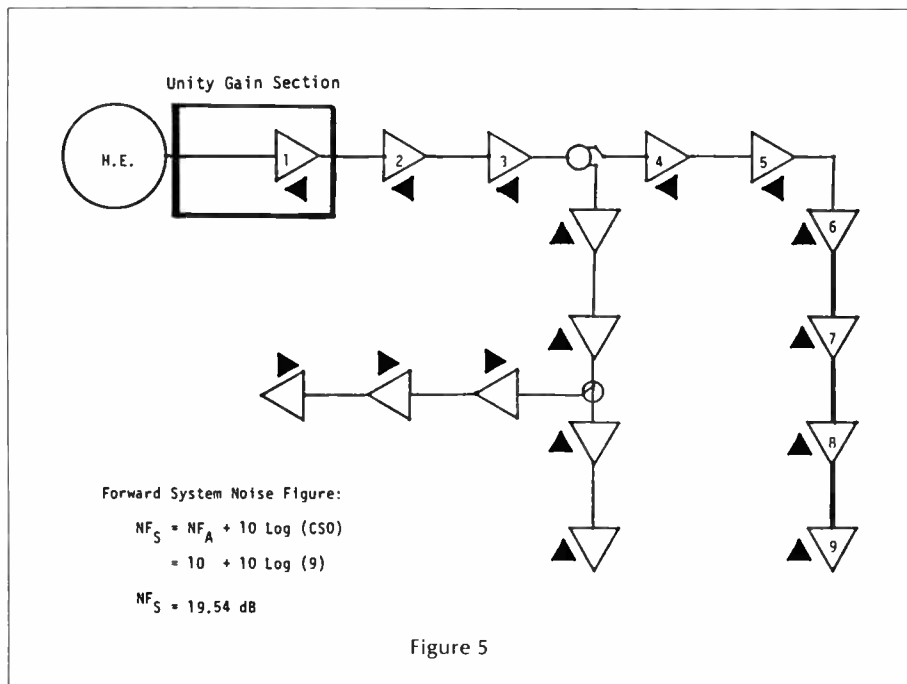
can have a noise figure, so can a return system when considered as a black box.

A second point made in this paragraph states that Formula 2 of my paper was to be used with an amplifier with 0 dB noise figure. The example was not for an amplifier with 0 dB noise figure, but for a 10 dB noise figure as defined in Figure 3 on page 50 of the June issue. In a unity gain system for which my example applies, the source of this noise is not the cable and the taps as Katz indicates; it is the amplifier!

### Forward noise

(reference p. 66)

I appreciate Katz' clarification for Figure 5 and Calculation 1. Katz does state "the formula used in that figure applies only to a cascade of unity gain sections." Figure 5 is reproduced below to show a unity gain section. A unity gain section is defined as the input of the cable span previous to an amplifier, to the output of the amplifier. Therefore, in Figure 5 there are nine unity gain sections. It also agrees with Katz' statement of required unity gain.



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Katz continues by stating that the unity gain sections are sections "in which the measurement is made from the input of an amplifier to an equivalent point in the cascade which is also the input to the amplifier." The unity gain section does not have to be an input to an amplifier. The unity gain section, as in Figure 5, is the input of a cable span to the output of an amplifier. The noise figure for one unity gain section is derived from illustration 1 below:

The amplifier with a noise figure of 10 dB is preceded by a 22 dB cable loss and, therefore, the noise figure for one unity gain section is:

### Calculation B

$$\begin{aligned} NF_{US} &= L + NF \\ 32 &= 22 + 10 \\ NF_{US} &= 32 \end{aligned}$$

### Where:

L = Cable loss in dB  
 NF = Amplifier noise figure  
 NF<sub>US</sub> = Noise Figure of the unity gain section

The noise figure for the forward system of Figure 5 uses the same formula as Calculation 1 and is repeated:

### Calculation C

$$\begin{aligned} NF_S &= NF_{US} + 10 \log(\text{CSD}) \\ &= 32 + 10 \log(9) \\ NF_S &= 41.54 \text{ dB} \end{aligned}$$

### Where:

CSD = Number of unity gain sections in cascade  
 10 log (CSD) = Cascade factor

The purpose of a noise figure is to define the thermal noise performance of the amplifier or system to enable the calculations of carrier-to-noise ratio and the assurance of an undetectable level of noise on a TV receiver.

Carrier-to-noise ratio of the system shown in Figure 5 can be calculated using either condition:

1. Noise figure of unity gain section

plus cascade factor = (NF<sub>S</sub> = NF<sub>US</sub> = 10 log(CSD)).

2. Noise figure of an amplifier plus the cascade factor = (NF<sub>S</sub> = NF<sub>A</sub> = 10 log(CSD)).

The results will be the same.

From Calculation 1, page 51 of my June article, the system noise figure is 19.54 dB, and is the amplifier noise figure plus cascade factor (condition 2 above). The input to the system is the input of amplifier 1 in figure 5 (as Katz has pointed out in his paper), and for the sake of discussion, is assumed to be 10 dBmV. Therefore, carrier-to-noise calculated from Katz' formula on page 66 of the September 1983 issue of CED is:

### Calculation D

$$C/N = C - TN - NF$$

### Calculation E

$$\begin{aligned} C/N &= C - TN - NF \\ &= 32 - (-59) - 41.54 \\ C/N &= 49.46 \text{ dB} \end{aligned}$$

Note that both Calculation D & E result in the same C/N of 49.46 dB, but that input signal level C is different.

The input signal C in Calculation B is 10 dBmV and is the actual level after the cable span as it enters the amplifier. In Calculation E, the input signal level C is prior to the cable SPAN and is 32 dBmV. From this, it can be concluded that the noise figure changed by the amount of the cable loss, and the higher input signal in Calculation E compensated for the noise figure change. The relationship reviewed here will hold true in all unity gain systems. No error will result from Calculation 1 for Figure 5 if the input level to the amplifier is used in a carrier-to-noise calculation.

$$= 10 (-59) - 19.54$$

$$C/N = 49.46 \text{ dB}$$

### Where:

C = Input signal in dBmV

TN = Input thermal noise in dBmV  
 NF = System noise figure

The same carrier-to-noise result can be obtained using Calculation C. The noise figure from Calculation C is 41.54 and is the unity gain section noise figure plus the cascade factor (condition 1). Again, using the carrier-to-noise formula:

### Formula 4 (reference p. 66)

Katz was correct in detecting that the signs in Formula 4 should have been opposite those shown. For clarification, I offer the following summary for formulas used for carrier-to-noise calculations.

### Calculation F

If,  $N_{out} = TN + G + NF$

Where:

$N_{out}$  = Thermal noise measured at output of an amplifier (dBmV)

TN = -59 dBmV thermal noise input to an amplifier for 75 ohm input.

G = Gain of the amplifier (dB)

NF = Noise figure of the amplifier

and if,

### Calculation G

$C_{out} = C_{in} + G$

$C_{out}$  = Carrier level at output of amplifier

$C_{in}$  = Level of carrier at input of amplifier

G = Gain of amplifier (dB)

then, carrier-to-noise ratio C/N is:

### Calculation H

$$C/N = C_{out} - N_{out} = C_{in} + G - (TN + G + NF)$$

$$= C_{in} + G - TN - G - NF$$

$$C/N = C_{in} - TN - NF$$

The input level can then be calculated to meet a given carrier-to-noise by rearranging Calculation H above to yield:

### Calculation I

$$C_{in} = C/N + TN + NF$$

Using Calculation H above in place of Formula 4 in my June paper will result in correct results.

In conclusion, I feel that Katz was trying to communicate the pure mathematics involved in analyzing thermal noise in CATV systems. We differ in our purposes, therefore, we have presented our discussions from two different perspectives. My presentation was from a practical application point of view; Katz' was from a purest's point of view. We do disagree on certain points, however, I feel that these disagreements are more a matter of semantics than mathematics.

CED

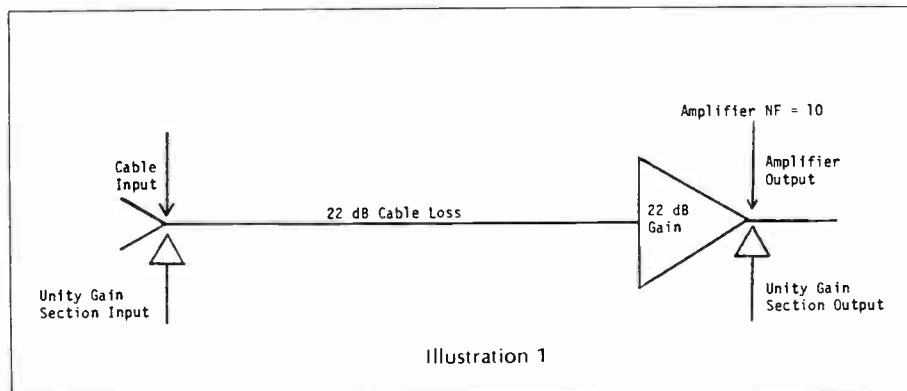
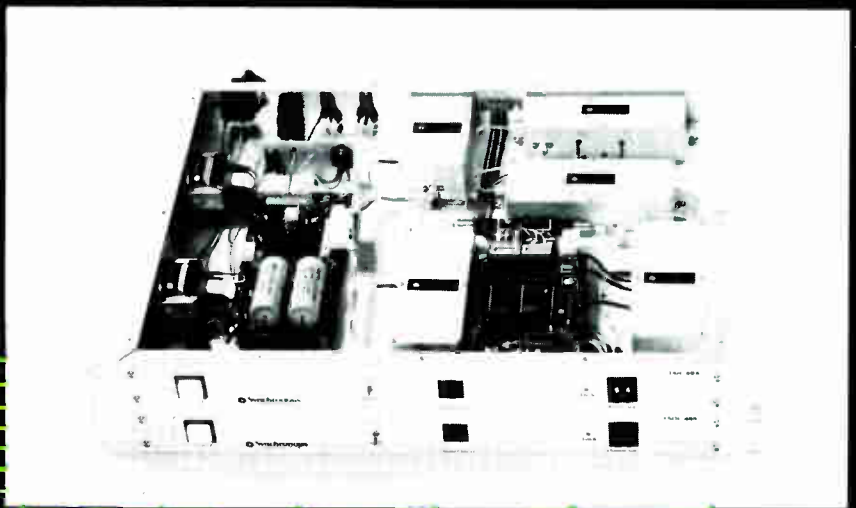


Illustration 1

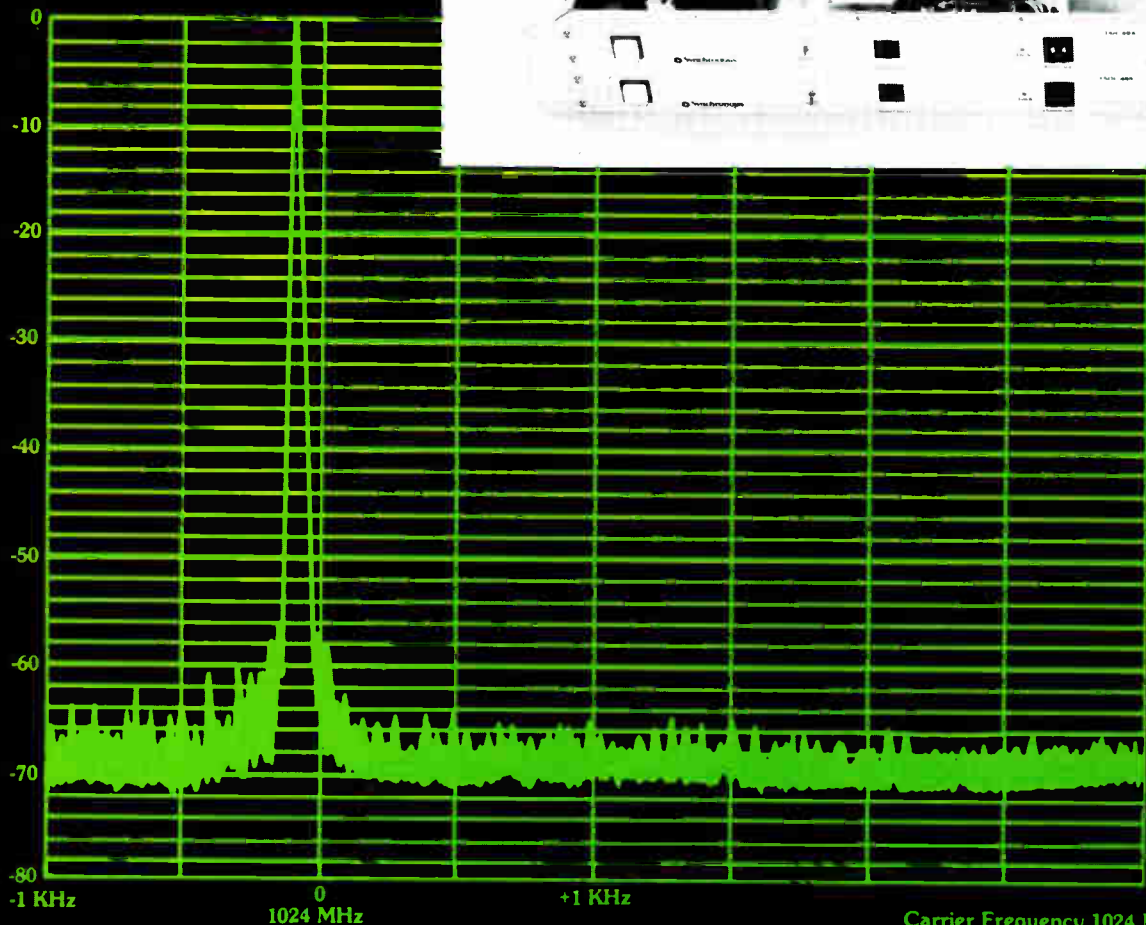


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## Western Show: Technical sessions agenda

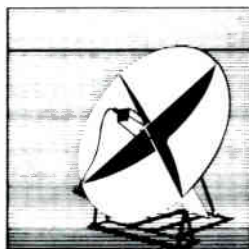


**The entire day of Wednesday, Dec. 14 is devoted to the technical sessions at this year's Western Show, with management sessions running concurrently. The Orange County Room in the Anaheim Convention Center is the site for all technical sessions, which were developed for the California Cable Television Association by Society of Cable Television Engineers. Co-chairmen for the program are Robert Vogel and William Riker.**

### Wednesday, December 14

**8:30-8:40 a.m.**

Welcome to Engineers and Technicians  
Tom Polis, president, SCTE



**8:45-10:30 a.m.**

"Broadband Engineering Issues."

Moderator: William Riker,  
director of engineering, NCTA.

*Microwave Frequency Coordination*

John Wong,

supervisory engineer, cable television branch, FCC Mass  
Media Bureau;

*Grounding Requirements—A Catch 22?*

Joseph Van Loan,

vice president/engineering, Viacom Cable;

*An Update on Cooperation Between Amateur Radio & the  
Cable Industry*

Wendell Bailey,

vice president of science & technology, NCTA;

*2° Satellite Spacing—How It Will Affect You—*

Fred Fourcher, president, Dan Bathker, director of  
engineering, Miralite Corp.;

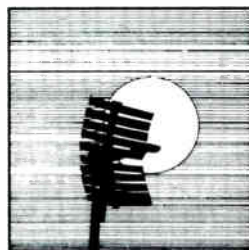
*Combatting Theft of Service*

Chuck Peters,

director of security, Cox Cable San Diego;

William Riker,

BCE/BCT Committee, SCTE, will give a brief update on the  
Society of Cable Television Engineers' Professional  
Designation Program for the industry.



**10:30-10:45 a.m.**

Break

**10:45-12:30 a.m.**

"Rebuild—Retrofit or Renew—How To Decide."

Moderator: Tom Polis,

executive vice president, Communications Construction  
Group.

Participants: Dan Pike,

vice president of engineering, Prime Cable;

Fred Rodgers,

president, Quality RF Services Inc.;

Jay Staiger,

project manager, active systems, Magnavox.

**12:30 a.m.-2:30 p.m.**

Lunch

**2:30-3:45 p.m.**

"New Technologies."

Moderator: Steve Ross,

chief, cable television branch, FCC Mass Media Bureau.

*Advanced Television Services Committee—TV's Future  
Format?*

William Riker,

director of engineering, NCTA;

*Digital Encrypted Audio Transmission in Cable Systems*

Tony Wechslerberger,

director, advanced engineering, Oak Communications;

*Feed Forward vs. Conventional Amplifiers—Capital vs.*

*Long-Term Operating Costs*

Michael Morris,

president, Morcom Engineering;

*550 Mega-Hertz: Is It In Our Future?*

John Dahlquist,

director of systems technology, Jerrold Distribution Systems  
Division.

**3:45-4 p.m.**

Break

**4-5 p.m.**

"Multi-Channel Television Sound."

Moderator: William Riker,

director of engineering, NCTA.

*A Review of NCTA's Multi-Channel Sound Tests*

Alex Best,

manager, research & development, Communications

Products Group, Scientific-Atlantic;

*How Will Multi-Channel Sound Impact Cable System  
Operations?*

Ned Mountain,

director of marketing, Wegener Communications;

*Separate Sound Carriage—An Alternative*

Dave Large,

vice president of engineering, Gillcable.

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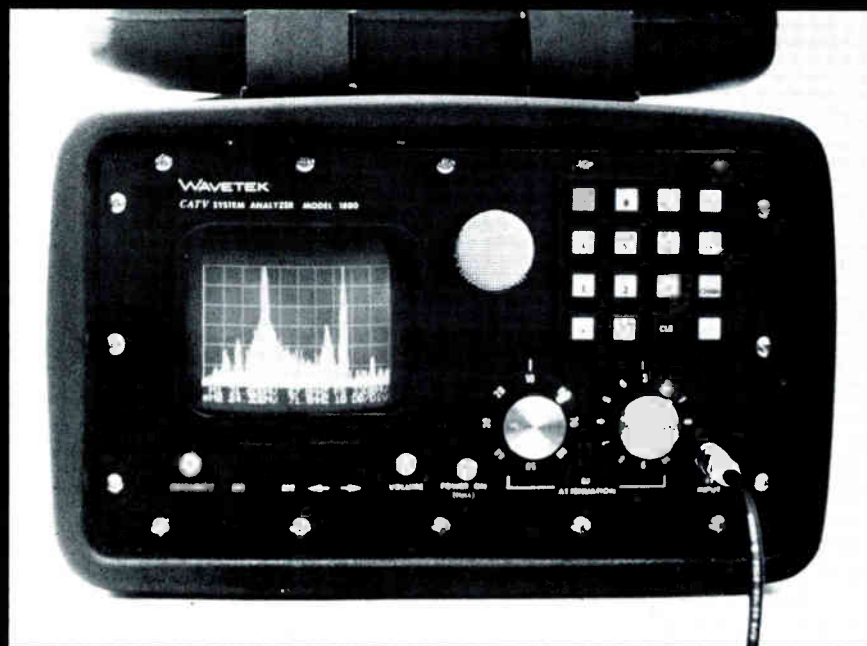
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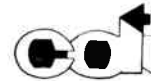
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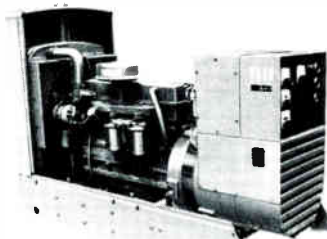
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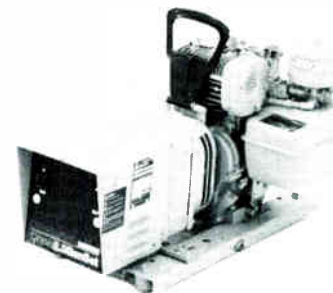
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*December  
13-15, 1983*

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Booth 1250A

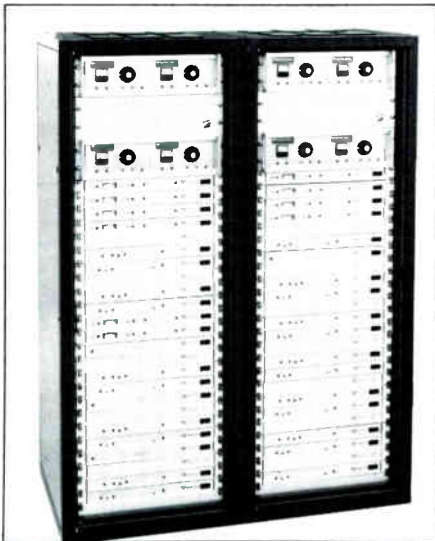
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## New products unveiled

Channel Commercial Corp. will unveil several new products at the Western Show to be held in Anaheim, Calif., Dec. 13-15. These products will include a CPH-816 pedestal, UTH-708 and USH-716 air and water tight enclosures, a CPH/DCPH-1730LP low profile amplifier housing. Integral's coax cablecon and Brook's grade level vaults also will be displayed at the Channel Commercial Corp. booth.

For more information, contact Channel Commercial Corp., 620 W. Foothill Blvd., Glendora, Calif. 91740, (800) 423-1863; inside California (213) 963-1694.



**Blonder-Tongue pre-fab headend**

## B-T pre-fab headends

Blonder-Tongue Laboratories will exhibit several pre-fabricated headends for use in processing off-air, satellite and local origination signals in CATV systems. A "deluxe" headend for larger distribution systems will be on display along with standard pre-fab headends and several miniheadends for off-air channel systems. Each system can be installed in new CATV systems or used to upgrade existing systems by adding satellite reception, off-air channels and local origination. Each headend is pre-tested, tuned and adjusted to meet a variety of signal conditions.

For more information, contact Blonder-Tongue Laboratories Inc., One Jake Brown Rd., Old Bridge, N.J. 08857, (201) 679-4000.

## S-A block downconverter

Scientific-Atlanta has introduced a series 365 block downconverter for use in converting the 3.7-4.2 GHz output of a standard LNA to the 270-770 MHz

frequency range. The block downconverter can be installed either indoors at the headend or outside at the antenna and is available in two versions. One model, the 365-1, is for indoor installations, while the second model, the 365-2, is weather-protected for use outdoors. Both models will be exhibited at the Western Show.

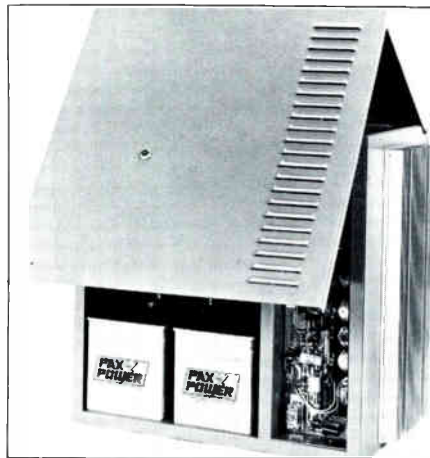
For more information, contact Scientific-Atlanta, One Technology Parkway, P.O. Box 105600, Atlanta, Ga. 30348, (404) 441-4000.

## TV Watch ad systems

TV Watch is marketing an automated advertising insertion and verification system, called the Stationmaster, and a random access version of the Stationmaster system. The Stationmaster is a completely integrated system comprised of an encoder, inserter tape player and verifier. It manages advertising spot insertions of local avails in as many as five channels simultaneously. A proprietary technique is used to strip, amplify and insert network sync in the vertical blanking interval. Audio levels also are automatically balanced when switching from networks to local spots and back.

The random access version of the Stationmaster allows the operator to insert any commercial from any position on the videocassette into any local avail from anywhere in the country.

For more information, contact TV Watch, 1819 Peachtree Rd., N.E., Suite 707, Atlanta, Ga. 30309, (404) 355-0100.



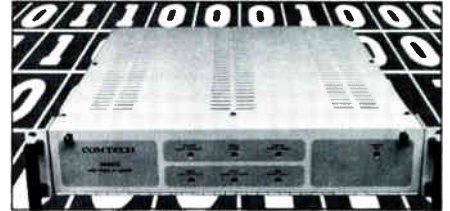
**Control Technology power system**

## Power system developed

Control Technology has developed a compact, lightweight 20 amp uninterruptible power system to be unveiled at the Western Show in Anaheim, Calif., next month. The system features a full 1200 watt output, continuous inverter operation and output overload protec-

tion for use in eliminating the need to reset circuit breakers after a cable short. Other components include a buffered output, a patented "cycle charger" battery charging system.

For more information, contact Control Technology, 1881 State St., Garland, Texas, 75042, (214) 272-5544.



**Comtech Data's M505 modem**

## Comtech adds modem

Comtech Data Corp. has expanded its series 500 modem line with the addition of the M505 broadband modem. This modem can be used in remote graphic, remote terminal and printers, computer-to-computer links, interconnection of PBX systems, process automation, robotics, telemetry, remote earth station data links, CATV systems or dedicated lines and point-to-point multidrop network applications. Data rates range from 19.2 Kbps to 10 Mbps (bits per second). The unit is composed of an interface adapter unit, which plugs into the rear of the chassis, and provides the interface for the data terminal equipment; a modulator module contained on one circuit board; a transmitter module/synthesizer module, which allows transmission over the 100 kHz-400 MHz range; a receiver module/synthesizer module that amplifies the received signal within the 100 kHz-400 MHz range and either up or down converts the amplified signal to a 45 MHz IF frequency;

For more information, contact Comtech Data Corp., 350 Hayden Rd., Scottsdale, Ariz., 95257-4692, (602) 949-1155.

## New line extender series

Delta-Benco-Cascade is offering a new series of line extenders collectively referred to as Redicom. These units employ hybrid technology and are for use in upgrading or rebuilding systems. Equipped with aluminum housings, these extenders can be used for aerial or small pedestal mounting. Present versions are for 450 MHz, but basic units are capable of 600 MHz.

For more information, contact Delta-Benco-Cascade Ltd., 124 Belfield Rd., Rexdale, Ontario M9W-1G1, Canada, (416) 241-2651. CED



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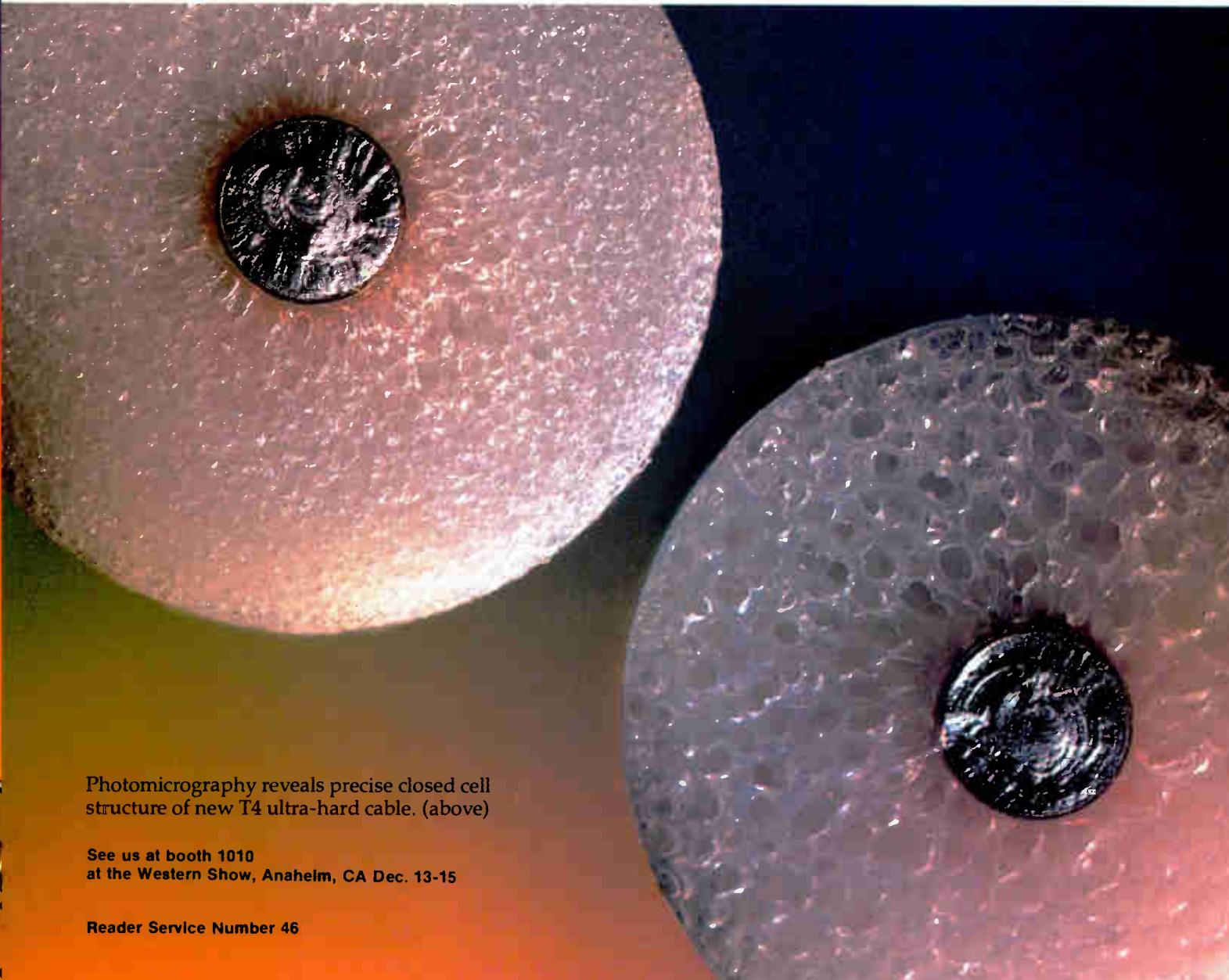
advanced foam processing techniques. With its precise cell matrix, you get vastly improved mechanical integrity both during cable installation and after severe environmental exposure.

T4's attenuation performance is more consistent. Its gradient foam density provides a signal

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Photomicrography reveals precise closed cell structure of new T4 ultra-hard cable. (above)

See us at booth 1010  
at the Western Show, Anaheim, CA Dec. 13-15

Reader Service Number 46

The National Cable Television Institute has promoted **Gerald Neese** to director of student services. Neese, the former operations coordinator, now will be responsible for training 4,500 correspondence students, representing 2,600 CATV systems from 530 MSOs.

**Larry Schuler** has been promoted to staff transmission engineer in the corporate engineering department of Heritage Communications. Prior to this

appointment, Schuler was chief technician for Heritage's Des Moines cable-television system. Schuler first joined Heritage in 1980 as a microwave technician.

**Charles Siegfried** has been named account executive for the Jerrold Division of General Instrument Corp. Siegfried most recently served as sales representative for W.B. Siegfried Associates, a manufacturing representa-



C. Siegfried



T. Abramovich

tive for high voltage electrical equipment. In another announcement, Jerrold appointed **Terry Abramovich** account executive with responsibility for customer accounts in Ohio. Prior to joining Jerrold, Abramovich was marketing manager for computer systems at Burroughs Corp.

**J. Lawrence Bradner** has been named general manager of Scientific-Atlanta's distribution, data and subscriber products division. Bradner, who joined S-A in 1977, most recently served as product manager for the Series 8500 set-top terminal product line. In his new position, Bradner will manage the division's operations, including engineering, manufacturing, sales and marketing.

**Timothy Keough** has been named general counsel and assistant to the president at Microwave Filter Co. Inc. Keough will handle all legal matters and also develop and manage special corporate projects. Keough's previous association with the firm was as an outside counsel.



**Mel Swope**, a television producer for NBC, has accepted a post as professor of telecommunications at San Jose State University. This position was made possible by a \$200,000 10-year pledge from Gill Industries in conjunction with state salary monies.

Commensurate with the opening of new regional offices, RCA Cylix Communications Network has appointed four new directors. **Ron Cohen** takes over as director of sales for the Central region, replacing **Bob Howard** who has moved to the firm's corporate headquarters to assume the post of director of business development. The Western regional headquarters, which will relocate to Dallas from San Jose, Calif., will be headed by **Nick Carter**, the former director of business development. The

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Reader Service Number 47

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If trench depth exceeds minimum bend radius of Coax-Cablecon, no sweeps or elbows are needed for easy, continuous duct termination. Transition fittings are available for joining to other systems.

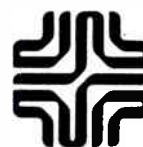
Cablecon has been thoroughly proven since the 1960s in utility distribution, street and highway lighting applications. Coax-Cablecon is manufactured specifically for the CATV Industry.

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Telecommunications Division  
P.O. Box 11269 Dallas, Texas 75223  
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Reader Service Number 48

## People

Eastern regional headquarters will continue to be based in New York City and directed by **Barry Greenspan**, who is director of Eastern sales.

**David Atman** has been promoted to national CATV sales manager at Lindsay Speciality Products Ltd.

Two personnel changes have been made at RMS Electronics Inc., with **Harry Bogatch** taking over as vice president of finance and **Lawrence**



H. Bogatch



L. Gabel

**Gabel** as controller. Bogatch, who also maintains the posts of assistant treasurer

and member of the board of directors, joined RMS in 1979 as controller. Gabel, who fills the post vacated by Bogatch's promotion, joined RMS in 1981 as assistant controller.

■ The recently created position of general manager of cable service operations at Zenith Radio Corp. has been filled by **Terrence Deegan**. In his new post, Deegan, the former general manager of international operations for Zenith's CRT and Components Operations, will be in charge of service, part sales and remanufacturing operations for the firm's addressable decoder and related products.

■ Nationwide Communications Inc., a Nationwide Insurance affiliate that owns and operates TV and radio stations and a cable TV system in Ohio, has chosen **Don Watkins** as vice president of engineering. Watkins, a previous corporate chief engineer for an NCI TV station, will now oversee all NCI studios, transmitting and engineering facilities.

■ **Mike Burton** has joined MycroTek as national sales manager for the firm's video products. Burton, a former sales representative with Honeywell Inc., will supervise all sales efforts for the Mycro-Vision video display information system, promote Mycro-Tek character generators and peripherals and participate in the development of marketing programs.

■ Six senior vice presidents have been named at American Television and Communications Corp. **Gary Bryson** has been appointed senior vice president and marketing; **James Cottingham**, senior vice president of operations with responsibility for a large portion of the company's 463 cable operations; **Larry Janes**, senior vice president of cable engineering in charge of maintaining all elements of the firm's cable plant and for evaluating and integrating new technology into ATC cable systems; **Henry Gerken**, senior vice president, secretary and general counsel; **Robert Rast**, senior vice president of business and technology development with responsibility for supervising ATC's new product development teams and R&D activities; and **Kevin Rorke**, senior vice president and chief executive of ATC's central Florida division.

■ **A. William LeDoux** has been appointed product marketing manager for satellite telecommunications systems and instrumentation at the Telecommunications division of AvanteK. **CEC**

# Don't sell cable security because you promised it. Sell it to make money.

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<b>Satcom 3R</b>					ESPN		24 hrs.	048*/#	7
ACS-N-The Learning Channel	Weekdays	6 a.m./4 p.m.	192*/#	16	Eternal World Television Network	Daily	8 p.m./12 p.m.	762*/#	18
	Weekends	6 a.m./1 p.m.			HBO	Daily	24 hrs.	None	24 (E,C), 13 (M,P)
AP News Cable		24 hrs.	None	6	HTN	Daily	4 p.m./4 a.m.	207*/#	16
ARTS	Daily	9 p.m./12 a.m.	311*/# (E,C,M) 519*/#(P)	1	Lifestyle		24 hrs.	None	3
Cable Health Network		24 hrs.	361*/#	17	Love Sounds		24 hrs.	None	8
Cable Jazz Network		24 hrs.	None	8	Moody Bible		24 hrs.	None	3
CBN		24 hrs.	414*/#	8	Modern Satellite Network	Weekdays	10 a.m./1 p.m.	243*/# 421*/#	22
Cinemax		24 hrs.	None	20 (E,C) 23 (M,P)	The Movie Channel		24 hrs.	None	5
CNN		24 hrs.	024*/#	14	MTV: Music Television		24 hrs.	None	11
CNN Headline News		24 hrs.	635*/#	15	National Jewish Television Network	Sundays	1 p.m./4 p.m.	None	16
C-SPAN		24 hrs.	None	19	Nice and Easy		24 hrs.	None	8
Daytime	Weekdays	1 p.m./3 p.m.	307*/#	22	Nickelodeon	Daily	8 a.m./9 p.m.	311*/# (E, M, C) 519*/# (P) 749*/#	1
Dow Jones Cable News		24 hrs.	None	3,6	PTL		24 hrs.	None	2
Electronic Program Guide		24 hrs.	None	3	Reuters News View		24 hrs.	None	6, 18
<b>Major Communications Satellites Serving North America</b>					Satellite Radio Network		24 hrs.	None	2
<b>Location:</b>		<b>Satellite</b>			SCAN		24 hrs.	None	6
<b>Degrees West Longitude</b>	<b>Present</b>	<b>Future</b>			Showtime		24 hrs.	576*/#	12 (E,C) 10 (M,P)
69		Spacenet II			Spotlight		24 hrs.	None	4
70		Southern Pacific-2 (Oct. 84)**			UPI Cable News		24 hrs.	None	6
72	Satcom 2-R	Galaxy-2 (mid. 84)			USA Cable Network		24 hrs.	601*/#	9
74					USA (during blackout)		varies	295*/# 601*/#	22
79	Westar-2	Telstar-2 (1984)			Video Concert Hall	Daily	4 a.m./6 a.m.	192*/#	16
83	Satcom-4	Spacenet-III			WFMT		24 hrs.	None	3
87	Comstar-D3	Galaxy-3 (June 84)			WGN		24 hrs.	None	3
91	Westar-3	GTE-1* (1984)			WTBS		24 hrs.	None	6
93.5					The Weather Channel		24 hrs.	None	21
94	SBS-3**				<b>Westar IV</b>				
95	Comstar-D1 & D2				SIN		24 hrs.	None	3X
96	Telstar-1				<b>Comstar D-4</b>				
97	SBS-2*				Country Music Television		24 hours	None	9H
99	Westar-4				<b>Galaxy 1</b>				
100	SBS-1*				SIN		24 hrs.	819*/#	6
103					GalaVision		Weekdays 4 p.m./4 a.m. Weekends 24 hrs.	None	20
104.5	Anik D-1				Contact programmer's technical department for more information on transponder use and alert tone.				
106									
108.5									
109	Anik-B** & C3								
114	Anik A-3								
116	Anik A-3								
117.5									
119	Satcom-2								
122									
123	Westar-5								
127	Comstar-D4								
131	Satcom-3R								
134	Galaxy I								
136	Satcom-1								
139	Satcom-1R								
143	Satcom 5								

\* Ku Band  
\*\* Dual Ku/C Band

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