CED™

New name and redesign

Communications Engineering & Design/The Magazine of Broadband Technology

November 1983

Data transmission: Embracing a new medium

Product Profile: Modems

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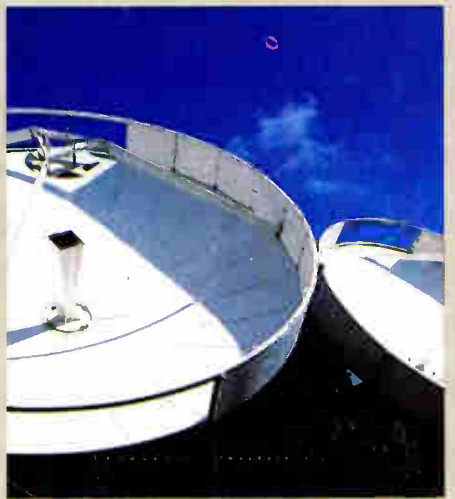

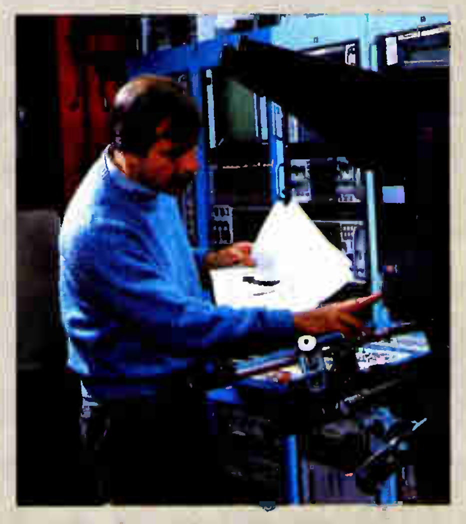

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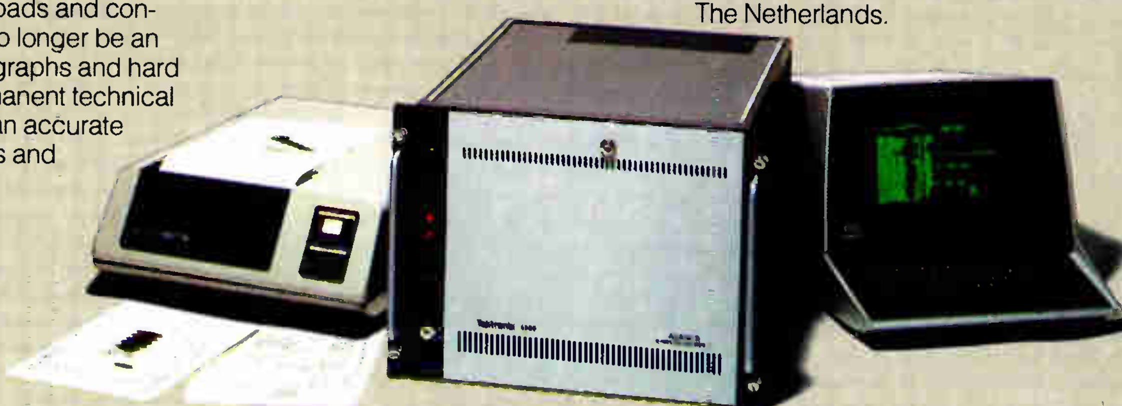

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If you are a cable operator circle 48
If you are a common carrier circle 49
If you are a manufacturer circle 50

Tektronix®
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Multichannel News—January 10, 1983

22

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."

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Jerrold.
First in cable TV.

GENERAL INSTRUMENT

Reader Service Number 2

CED™

November 1983

COMMUNICATIONS NEWS 16

Strength in numbers

Cox Cable Communications consolidates its engineering staff in order to decentralize in the field and announces agreement with Jerrold to provide software and marketing for video products.

INTERFACE 22

New business for old standards

WTBS will offer its vertical blanking interval to Southern Satellite Systems, while ITT and The Financial Times are exploring program delivery via personal computers.

DATA COMMUNICATIONS SECTION

FEATURE 1 28

Southern Appeals

Ron Rankins of Appalachian State University in Boone, N.C., demonstrates that one doesn't require a large metropolitan location to set up a data communications network. ASU's Appalnet serves the campus with other long-range goals in mind.

FEATURE 2 32

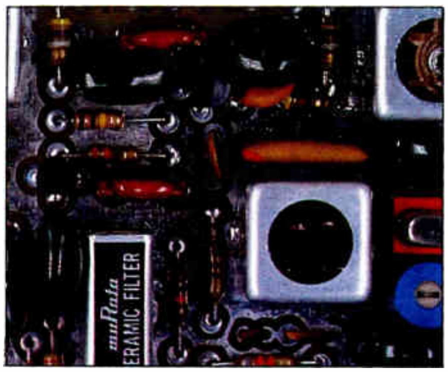
Wide open spaces

Brad Anderson of Wideband Data provides another look at the potential for business communications for cable operators.

This month features a redesign for *CED* in our continuing efforts to expand our coverage, which now incorporates business communications and data transmission, and to make *CED* more readable. Different typefaces and other graphic changes highlight the redesign.

Wang DX 9600 data modem

Modems are the topic of interest this month, as described in our features, **TECH II** and **Product Profile**.



About the cover

Gay Clyburn, director of the Office of Public Information at Appalachian State University, Boone, N.C., furnished *CED* with this month's photo, which is the inside of a standard broadband modem. Our thanks for the picture.

Worker enrolled in one of Control Data's PLATO in-plant maintenance courses operates a touch-sensitive, high-resolution screen to manipulate a control device. The courseware's graphic capability allows the user to simulate actual work conditions in the plant. ***See story in* Interface, *p. 22.***

TECH II 37

Step by step

David Slim of Scientific-Atlanta breaks down the parameters of data transmission and business communications for those just taking notice of the vast business waiting for them.

PRODUCT PROFILE 42

CED takes a look at some of the leading broadband modems available to the cable industry.

WESTERN SHOW BOOTH GUIDE 44

Western showdown

The Western Show in Anaheim, Calif. is rapidly approaching—Dec. 13-15. Here is the most recent update for all the companies exhibiting as of Oct. 31. California Cable Television Association officials, who are charged with organizing the event, predict good crowds this year.

TELEDELIVERY 49

And Europe, too?

International Videotex/Teletext News Publisher Gary Arlen once again provides *CED* readers with some insight into that field, and also writes about the potential European market that is growing.

DEPARTMENTS

 CED. (USPS 300-510) (ISSN 0191-5428) is published monthly plus extra editions in March, June, September, plus 2 in December by Titsch Communications Inc., 2500 Curtis, Suite 200, Denver, Colorado 80205. ©November 1983, Volume 9, Number 12. Subscription Price: 1 year, $26.00; 2 years, $43.00; 3 years, $63.00. OUTSIDE USA 1 yr. $64.00; 2 yrs. $89.00. MUST BE PREPAID IN US FUNDS ONLY! Second-class postage paid at Denver, CO. *CED* is published on behalf of all parties, including the Society of Cable Television Engineers (SCTE). POSTMASTER: Please send address changes to P.O. Box 5727-TA, Denver, Colorado 80217-5727. MEMBERS OF THE BPA.
BPA

Cable data services get reprieve

Rep. John Dingell (D-MI) has put on hold a plan to amend a telephone bill now pending before this Commerce Committee to allow state regulation of cable data services. The proposed amendment would have allowed states the ability to regulate non-video cable services, including data channels and institutional networks. Dingell had planned to attach the amendment to H.R. 4102, which intends to alter the federal system to telephone access charges, but changed his mind after the new BOCs said they would not support H.R. 4102, with or without the intended amendment.

SBE name change settled

The Society of Broadcast Engineers, with a cablecaster as their organization's president, have decided against expanding their name. Chosen last spring, the new name for the association would have been the Society of Broadcast and Communications Engineers, selected as one attempt to expand the society's membership and attract engineers from other fields. However, in a recent vote of the full membership, the two-thirds approval of the name was not obtained, thus forcing a return to the original title. Despite this move, the association is still determined to solicit membership from outside the broadcast industry. SBE President Doyle Thompson, director of engineering for The Weather Channel, noted that he was glad the issue was concluded and hoped that all the board could now return to the task of strengthening the society.

The China connections

Seeking other shores, Tektronix Inc., with headquarters in Beaverton, Ore., has established a product service facility in Peking, China. Officially opened in early September, the Tektronix China Service Center will be cooperatively operated with the Chinese Academy of Services, the official sponsor and operations management for the venture. According to Tektronix oficials, the service center will be located at the Institute of Computing Technology in Peking. Tektronix' immediate goal is to provide high-quality product service, while long-range objectives include offering Tektronix products to the Chinese market and foster stronger business and technical relationships between the U.S. and China in general.

War games

New York has escalated its war against SMATV operators in New York City. In comments filed with the Federal Communications Commission, the New York State Commission on Cable Television argued that by allowing Earth Satellite Communications Inc. of New Jersey to assert federal pre-emption of state and local regulation, the commission's action could be labeled "racist"—because it would keep cable out of poor and minority areas. The state's filing also contended that private cable systems in the outer boroughs of New York could cost the franchisees up to $793 million in lost revenues, the equivalent of some 73 percent of the cost of wiring those boroughs.

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Seminars

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

1-3: The **Western Design Engineering Show and Conference** will be held at the Los Angeles Convention Center. Contact (212) 370-1100.

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

1-4: The **International Videxpo '83** will be held in Acapulco, Mexico. Contact (212) 489-9245.

2-4: Magnavox CATV Systems will hold a field training seminar with its Mobile Training Center in Nashville, Tenn. Contact Laurie Mancini, (800) 448-5171; in New York, (800) 522-7464.

5: The second annual Community Access Conference sponsored by **QUBE Cable of Dallas** and the **Dallas Cable Television Board** will be held at the Central Dallas Public Library. Contact (214)328-2882.

7: A symposium on "State-of-the-Art Microcomputers" presented by the **Associated Information Managers** in association with the **Smithsonian Institution Office of Information Resources** will be held at the Smithsonian's Carmichael Auditorium in Washington. Contact Sheila Brayman (301) 231-7447.

7-9: The ninth annual **Scientific-Atlanta** Satellite Communications Symposium will be held at the Hyatt Regency-Atlanta Hotel in Atlanta. Contact Betsy Crawley, (404) 449-2274.

8-10: A workshop on the "Introduction to Microwave System Engineering" sponsored by **abc TeleTraining Inc.** will be held in Chicago. Contact (312) 879-9000.

14-18: Hughes Aircraft Co. will hold a technical seminar on its AML local distribution equipment at its Torrance, Calif., facility. Contact (213) 517-6000.

15-17: A workshop sponsored by **abc TeleTraining Inc.** on the "Fundamentals of Telecommunications for the Non-Technical Manager" will be held in Chicago. Contact (312) 879-9000.

15-17: A **Jerrold** technical seminar will be held in Spokane, Wash. Contact Diane Bachman, (800) 523-6678 or (215) 674-4800.

Looking ahead

Dec. 11-12: NCTA's National Cable Programming Conference, Biltmore Hotel, Los Angeles.
Dec. 13-15: Western Cable Show, Anaheim Convention Center, Anaheim, Calif.
Jan. 18-20: Texas Show, San Antonio Convention Center, San Antonio, Texas.
Feb. 6-8: National Mobile Communications Expo, Disneyland Convention Center, Anaheim, Calif.
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.

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Scratching the surface

With this issue, we have formally announced our intentions in covering the data transmission business that offers so much potential for the cable television industry. As we all have seen this year, the industry has not had the best of all possible times—both on the software and hardware ends of the business. It would appear that for some operators, seeking new avenues in which to capitalize on existing plant and facilities only makes sense. We have heard about the threats from the AT&T and the BOCs following divestiture, and there is still a fight on Capitol Hill over deregulation of the data business and how it will affect cable, although it may be on the wane. Naturally, this will have an effect on us, but it should only serve to make the cable industry stronger—after all, that is what competition is intended to accomplish. The data business is alive and well, thank you, courtesy of the phone companies. But it's high time cable operators, with excess capacity within their system, to enter into the same business and, like MCI and the other cut-rate long distance carriers, promote their capabilities to the business community and in the long term, to consumers. The age of business communications via cable is now on the horizon and it will be a bright one.

For that reason, we have expanded not only the editorial scope of *CED*, but have incorporated a name change as well. Communications Engineering Digest has now become Communications Engineering & Design. We chose the different name because we feel that the name "Digest" does not best describe *CED*, but more importantly, the new name reflects our desire to examine more closely the designs of systems, data transmission operations and the proliferation of the industry in general. We all start with a design and we go from there. And that design is constantly changing as a system adapts and evolves from a simple 12-channel system to a sophisticated 400MHz 54-channel full telecommunications center. Increasingly in the decades ahead, cable television systems will take on more importance in the communities they serve, providing more than just entertainment, news and information.

There is a vast array of other non-entertainment services that loom ahead for the cable operator. Already, we have seen the success of two-way transmission. As such a system becomes more lucrative and it becomes a viable cost factor in terms of adding a second cable to existing systems, then the viability of security, medical alert, electronic fund transfer and polling, among other sophisticated proposals, will become more of a certainty. Like any busy individual, I find free time becoming less and less scarce and the last thing I enjoy doing during those less demanding moments is spending time waiting in lines at the bank, the grocery store, the department store. I wait in earnest for the day when I can send checks to whomever via cable and order Christmas presents months ahead by punching up a certain code. Further, who has much time for correspondence these days? With electronic mail, one has to but sit at a terminal and bang out a series of letters, whether they be business or personal, and be assured that they will be sent that day, or within the hour. Personal contact that does not require use of the telephone will no doubt proliferate.

Despite the beauty of screen reading, there also will always be a need or desire on the part of consumers to physically hold their newspaper or magazines. I see text services as being a complement to our traditional forms of reading. And I think we have a very rosy future for cable and, on on a more personal basis, for *CED*. The staff at Titsch Communications has always been one that can see ahead, and we want to continue that trend. In addition, we are graced with a talented pool of writers, who contribute either on a regular or select basis, material appropriate for publication. We will continue to call upon their talents and solicit new authors. With the addition of Frank Hogan as *CED's* new managing editor (Phil Murray has returned to our mobile publications at Titsch—*Two Way Radio Dealer* and *Radio Communications Report*), we will continue our tradition of a quality publication. We have tried with our redesign to make *CED* more readable in several ways. As we see the need to change, we will. The beauty about working for a technical and engineering publication is that we can evolve as quickly as the industry. And we all have just scratched the surface.

Peter Evanow

Cox strengthens engineering staff, operations

Cable operator consolidates its engineering divisions; enters into agreement with Jerrold on new services

ATLANTA—In a move to strengthen its Corporate Engineering staff, Cox Cable Communications Inc., has formed a single corporate engineering operating group comprised of individuals from the company's existing Technical Support Services and Divisional Engineering staffs.

Richard Clevenger, director of corporate engineering, has been selected to head the new group, Geoffrey Gates, vice president of engineering for Cox Cable, announced.

According to Gates, the formation of this new group will represent a major effort to shift responsibility and authority in field construction and maintenance activities to the system level, decentralizing such operations. "We will be able to respond in a more timely fashion to complications in our technology that are at times perceived unfavorably by the customer and the cities we serve," Gates said.

In a separate announcement, Cox Cable has signed an agreement with General Instrument's Jerrold Division that will lead to the development, manufacture and marketing of a fully-integrated, two-way interactive video entertainment and videotex system for residential homes.

The agreement intends to utilize transactional capabilities, using Jerrold's Communicom home terminals and MetroNet data transport network with Cox Cable's host computer facility and service package offering. The system is intended to allow financial institutions, publishers and other information retrieval and two-way requirements to tie into a single, integrated data transport network. Executives from both companies said the resource pooling could lead to marketing such a system to operators by late 1985.

Late next year, Jerrold will test a prototype of the device with Cox supplying software for the experiment, including video games, videotex information from various databanks and home banking and shopping services. For the past year, Cox has been testing those concepts among 1,000 homes at its San Diego system through its INDAX interactive venture. Colin O'Brien, vice president and deputy group executive for broadband communications at General Instrument, said the two firms would pick up separate costs for contributions to the project and do not intend on engaging in a complete joint venture. "We've formed no entity and don't intend to," he stated. O'Brien called it "an agreement to cooperate."

Cox Cable President David Van Valkenburg said Cox has affirmed the operational performance and readiness of the cable plant. "We will continue to explore product viability, packaging concepts and converter functionality, in addition to subscriber reactions and interests in this combined effort with Jerrold." Van Valkenburg also stated that the company's INDAX system, presently delayed in Omaha, Neb., and New Orleans, will continue its delay in New Orleans, but would be running in Omaha "as soon as it is technically and economically feasible."

Satcom IIR to activate soon

Two months after its launch, RCA officials are predicting Satcom IIR to begin operations sometime this month

CHERRY HILL, N.J.—Sometime this month, RCA will activate the third in its series of "advanced" communications satellites. This satellite, designated Satcom IIR, was launched Sept. 8, approximately eleven months after the advanced RCA satellite, Satcom V, was launched Oct. 27, 1982.

Satcom IIR, which is located at 72 degrees west longitude in the geostationary arc, the slot formerly occupied by Satcom II, has been undergoing system tests during the past two months. Now, with all systems having "checked out" satisfactorily, according to John Williamson, RCA American Communications Inc., it's just a matter of setting a "date" to activate. Williamson expects this date to fall within the month.

Satcom II, the satellite removed from its slot to provide space for Satcom IIR, has been moved to 119 degrees west longitude, where it co-occupies a spot with another RCA satellite. Both satellites will be moved to another position next year in order to vacate the slot for another bird already allocated to occupy the spot in mid-1984 by the FCC.

RCA "advanced" satellites incorporate technological advancements not included in the original RCA Satcoms. These advancements include the use of solid-state transponders, which RCA officials claim result in "greater reliability and increased traffic-handling capacity." Another improvement added to the satellites' transponders is the extension of their power from 5.5 watts to 8.5 watts. This increase in power provides greater sensitivity at receiving stations.

But by far the greatest improvement of all is the addition of a shaped beam antenna. This antenna is comprised of a large aperture reflector that shapes the antenna beam and multiple feed horns that are equipped with the size, location, power division and relative phasing necessary to achieve the desired contour. Through the use of this antenna, in conjunction with each satellite's 24 solid-state transponders, signal coverage in all 50 states is increased substantially.

Together, these advancements yield a "50 percent increase in capacity over existing satellites now in orbit, " contends Charles Schmidt, division vice president and general manager for RCA Astro-Electronics, the subsidiary that built the advanced satellites. Other ancillary benefits purportedly offered by these satellites, and attributable to advanced design features, are: reduction in the ground investment for two-for-one video reception, compatibility with existing in-orbit RCA Satcom satellites and terrestrial facilities and longer longevity, an increase in each satellite's life expectancy from eight to ten years.

According to Williamson, once activated, Satcom IIR will be used for commercial traffic and government applications. Voice and data channels will be leased to both of these sectors.

Concomitantly, but not a direct result of the Satcom IIR launch, was the announcement of the contract RCA signed with American Satellite Co. (ASC). Under the terms of the agreement, RCA Astro-Electronics will build a three satellite system. The contact, estimated at a value in excess of $100 million, involves the building of three dual-band, C and Ku band, communication satellites for ASC. Launch support and training of ASC personnel also will be provided.

—*Constance Warren*

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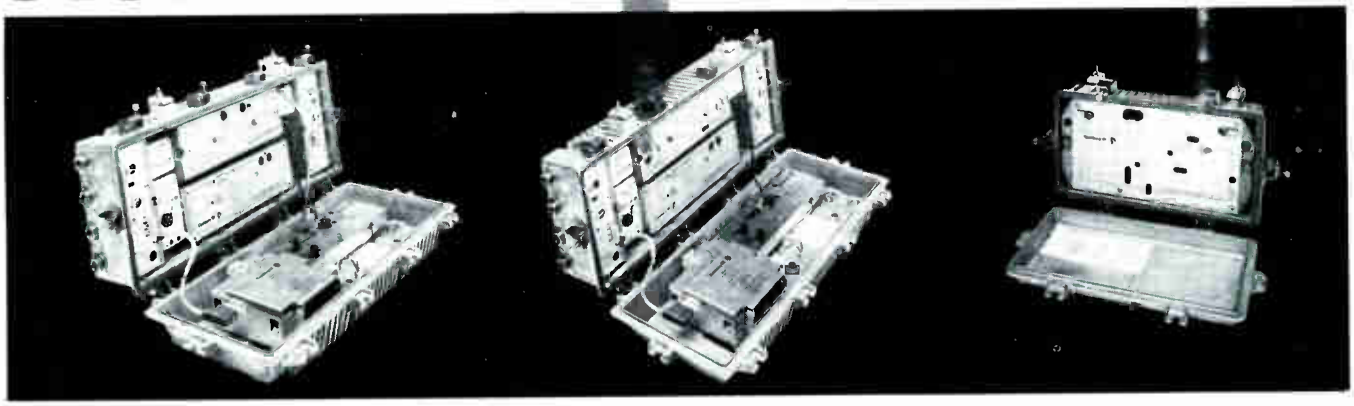

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	Cross Modulation	−102dB	−96dB	−88dB	
Bridger	Output Level	+47dBmV	+49dBmV	+49dBmV	
	Composite Triple Beat	−74dB	−70dB	−70dB	
	Cross Modulation	−74dB	−70dB	−70dB	
Line Extender	Output Level	+47dBmV	+49dBmV	+49dBmV	
	Composite Triple Beat	−74dB	−70dB	−70dB	
	Cross Modulation	−74dB	−70dB	−70dB	

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Reader Service Number 10

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Reader Service Number 11

New SMATV Association

Blonder-Tongue forms National Association of Satellite Master Antenna Contractors

OLD BRIDGE, N.J.—The National Association of Satellite Master Antenna Contractors has been founded by Blonder-Tonque Laboratories Inc., based here. The announcement was made by Daniel Altiere, senior vice president of Blonder-Tongue.

The association, open to qualified installation contractors, provides professional assistance in system design, layout, and marketing/sales strategy.

In addition to receiving priority status in these areas, charter members of NASMAC will receive a $50,000 principal employee paid-up 24-hour accidental death and dismemberment insurance policy. NASMAC members will also receive window and truck decals, letterhead seals, jacket and cap emblems and a free one-year subscription to the *NASMAC Installer*, a new publication written and edited for the various needs of its members.

The goal of the association, as stated by Altiere is "to have available a qualified and accredited group of professional installation contractors having installation expertise in MATV, CATV, SMATV, CCTV, home antenna systems and alarm and sound systems to introduce to our various contacts throughout the United States."

Emergency grant

ELRA Group to study cable Emergency Alert

SAN FRANCISCO—The Federal Emergency Management Agency (FEMA) has awarded a $200,000 contract to the ELRA Group of San Francisco to study the flexibility of extending the Emergency Broadcast System to cable. The 18-month project will include a survey of 5,800 cable systems and a field test at two sites. The study will result in policy and legislative proposals to develop cable as an emergency notification resource.

The continuing growth in the audience for satellite-delivered cable services created the need for the project, according to officials. Viewers of these services are beyond the reach of the existing Emergency Broadcast System, particularly in the event of local emergencies such as floods or tornadoes. On the plus side, addressable cable systems and other features of state-of-the-art cable systems have the potential to increase the effectiveness of emergency broadcasts. In addition, viewers of The Western Channel also have the ability to see local warnings from the system affiliate. However, it was determined that further proliferation of emergency alert is required.

The first year will be devoted to surveying all of the cable systems in the United States to determine their current involvement in emergency planning and their emergency broadcasting capabilities. A six-month field test will follow, during which teams of researchers will visit the two locations to study the aftermath of test alerts and any actual emergencies that occur during the time the tests are conducted.

One of the tests will involve a relatively simple approach, such as broadcasting the emergency alert notification over automated news or government access channels. More sophisticated emergency alert equipment, capable of interrupting all audio and video channels simultaneously and alerting homes whose sets are not in use will also be tested. The project will culminate in the preparation of model ordinances and regulations for local, state and federal governing bodies. The Washington, D.C., law firm of Shooshan and Jackson will conduct the policy analysis.

New fiberoptic company

Optical Cable Corp. formed to offer cable to cable

SALEM, Va.—Optical Cable Corp. has been organized to manufacture fiber-optic cables and high temperature electrical cables for the commercial and military marketplace. The company will produce a wide variety of simplex, duplex and multiple fiber cables including breakout cables and cable assemblies. Factory termination and on-site installation services will be offered for all cable products.

The principals involved in the new company are Robert Thompson and Robert Kopstein. As president of Cable Technology Inc. Thompson has served as a consultant to the U.S. government and to the fiberoptics industry since 1981.

Kopstein has worked as manager of Cable Production and Development for the Optical Systems Division of the Phalo Corp. since 1981. Together, Thompson and Kopstein have 14 years of experience in the design, development, manufacturer and testing of fiberoptic cables.

The company began producing cables in October 1983 at its new facility located in Salem. Officials can be reached at (703) 389-9900.

Magnicom moves

Business management company relocates office

STAMFORD, CT—Magnicom Systems has moved its headquarters from Greenwich, Ct., to Stamford in order to accommodate its growing staff and increased business activity. According to Magnicom President J. Neil Smith, "the move complements our aggressive market strategy. When Control Data, Applied Data Research and Storer Communications joined forces earlier this year to develop this company (an outgrowth from Station Business Systems), we set some tough goals. We've achieved some of these and our new headquarters should help us meet our ambitious business plan."

Presently, the company has sold six of its computer-based management systems; four MARC/10s to cable systems and two BAT 1700s to broadcast stations. Magnicom develops and supports such management systems for the telecommunications industry. The new address, effective Nov. 1, is 1177 High Ridge Rd., Stamford, 06905; phone number is (203) 968-0088.

BAER resigns from SCTE

SCTE executive vice president to pursue other business interests

ALEXANDRIA, Va.—Judith Baer, executive vice president of the Society of Cable Television Engineers Inc. since 1977, has advised SCTE's elected leadership of her intention to pursue other professional business interests instead of renewing an employment contract with the society. SCTE President Thomas Polis accepted Baer's resignation, effective Oct. 31, 1983, and announced that the society will relocate its headquarters office to the Philadelphia area by mid-November. There is no immediate plan to fill the vacancy of executive vice president, however, Polis and the SCTE Board of Directors will proceed with plans laid out for the society, including CABLE-TEC EXPO '84 scheduled for The Opryland Hotel in Nashville, March 5-8.

The new address for SCTE, effective Oct. 31, 1983, will be P.O. Box 2389, West Chester, PA 19380.

NewsSweep

■ Graphic Sciences has reached an agreement with Power and Telephone Supply Co. for distribution of its graphic character generator systems. The company also is planning to introduce an updated version of its System 840 sometime in the near future. This unit will monitor and insert graphic commercials into three satellite services while also displaying graphic pages on a local origination channel.

■ Texscan Corp. has completed a major facilities move in Indianapolis, Ind. Texscan Instruments, the founding division of Texscan Corp., has moved its entire manufacturing, shipping and warehousing, engineering, research and development, sales and sales support and administrative staff to a new building located at 3169 North Shadeland Ave., Indianapolis, Ind. 46226. The company's new phone number is (317) 454-4196.

■ AvTek Inc. has signed an agreement with Anixter Communications to distribute the AvTek model 2901A digital time domain reflectometer for use in locating opens and shorts in all types of metallic-paired cable. The unit also can be used in measuring lengths of cable on the reel, either aerial or buried. Anixter-Microsat, the Canadian distribution arm of Anixter Communications, will be distributing the product in Canada.

■ Adams-Russell Co., Video Information Systems Division, and Colony Communications have entered into an agreement in which Colony will purchase the ARVIS-7000™ system and use it for automating functions associated with the sales and administration of local and regional CATV advertising. One of the first installations of the system by Colony will be in the greater Providence, R.I., area.

■ Microdyne Corp. will manufacture a new computer-addressable tap system for Domestidyne of New Orleans, La. Domestidyne, a joint venture between Microdyne and Domesticom Corp. has placed orders for the system totaling more than $500,000 and expects to use the system as an integral part of their programming package and to increase the flexibility and revenues in each of their hotel, motel and apartment installations. Domestidyne currently provides TV programming packages to these types of complexes in 53 cities.

■ TOCOM Inc. has changed the name of its 55 PLUS line of baseband addressable products to TOCOM PLUS systems. This name change, which becomes effective Nov. 1, was initiated, according to the company, to provide a family name applicable to all the new technology currently being developed by the company.

■ Tele1st Entertainment Recording Service and Gill Management Services Inc. have formed a joint venture in which both companies will collaborate in the development of computerized management software for the Tele1st service. Tele1st, a wholly-owned subsidiary of ABC Video Enterprises, will launch its service—programming transmitted in scrambled form during late night hours for automatic videocassette recording in subscriber homes—in the first quarter of 1984. The pilot market of Chicago has been chosen to receive the service at this time.

■ Telecommunications Construction Systems Inc., formerly known as Texas Cable Services Inc., is in the final stages of completion of the rebuild construction of a Warner Amex Cable Communications Inc. system in Malibu, Calif.

■ Magnavox CATV Systems has introduced a rebuild analysis service for use in assisting cable systems in determining the performance status of their distribution equipment and for rebuilding and upgrading systems. The service will consist of three stages: a paper study, which includes a process of assimilating information about the system, an engineering analysis and a detailed map analysis; a field study performed by a Magnavox field engineer; and a system design stage where a new system in designed with updated technology.

Clarification:

A letter from Thomas Christy, director of marketing for Comtech Antenna Corp., states in reference to the "Multiple Beam Antenna Systems" article in the Sept. issue of *CED* (p. 34), that with the exception to Antenna Technology Corp.'s Simulsat 5-meter antenna, no other Antenna Technology Simulsat dish was range-tested on Comtech's range. This sets the listing straight.

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Reader Service Number 16

WTBS takes on new role

Southern Satellite Systems plans to use WTBS' vertical blanking interval as electronic mail conduit

TULSA, Okla.—While everyone else is busy pondering and revising their New Year's resolutions, Southern Satellite Systems Inc. (SSS) will surge forward with a Jan. 2, 1984, debut of its cable electronic mail service.

This service will use the vertical blanking interval of the WTBS signal to convey messages from programmers to operators. Messages will be integrated into the WTBS signal at SSS' Douglasville, Ga., uplink facility. Operators that receive the signal will be able to receive and decode the transmitted message through the use of a special demodulator, decoder and printer supplied by the manufacturers of the equipment and SSS.

According to Karen Ferguson, marketing representative for SSS' CableTex operation and representative for the project, the operator will select from a choice of two decoders and two printers, but will have to buy the Zenith demodulator in order to receive the service. Decoders can be purchased from either Zenith Radio Corp. or Compuvid, Texscan MSI's recent acquisition, and printers can be obtained from either Star or Epson. SSS will use Wegener hardware in conjunction with a computer and its own custom designed software to encode and funnel programmers' messages into the WTBS vertical blanking interval.

SSS officials estimate that the hardware necessary to receive the service will cost operators somewhere in the neighborhood of $800-$1200. While this initial capital outlay may seem a little harsh at first, operators will benefit in the long run by being able to use the same equipment to receive and process messages sent from all those subscribing programmers whose signals they receive.

The cost of the service will be the programmers' burden, starting out at a minimum flat monthly rate of $500 for up to 20 messages. Every message sent beyond this limit will cost the network an additional $25. No additional charges, however, will be exacted for sending the same message to more than one operator. In addition, each network will be allocated a daily transmission capacity of 35K, or the equivalent of approximately 10 81/2 x 11-inch pages.

As of yet, no programmers have signed up for the service, but negotiations with several are underway, according to Sarina Klaver, director of corporate communications for SSS. Although the service is "really in the preliminary stages," Klaver is confident that it will be well-received. "There is interest we know for sure," she insists.

Klaver's confidence in the venture is based on the results of an investigation conducted by an ad hoc group assembled by the Cabletelevision Advertising Bureau. This group, referred to as the PIN (Program Information Network) committee, issued a request for proposals for electronic mail services last July. This RFP was predicated on there being a well-established and clearly defined demand for the service within the industry.

Among the prominent industry representatives that comprised the PIN group were Kathryn Creech, CCI; Dave Seton and Don Olson, Colony Communications; Vince Fazio, CAB; Roger Williams, ESPN; Mike Ban, The Weather Channel; Don Kater, MSN; Lonnie Guida, USA; Nancy Kadner, MTV; Les Greenwald, CHN; and officials from Turner Broadcasting and Warner Amex Satellite Communications. According to Klaver, this group reviewed several proposals, including one from Data Communications Corp., and selected SSS' as the "best." Approval from this diverse group, she contends, attests to the likelihood of the service's success.

Privacy and flexibility, two potentially problematic areas for the service, will be assured, Klaver argues, through the use of access and address codes. Each subscribing network will be assigned its own unique access code that will enable it to access and enter messages into the SSS computer. Once the network has accessed the computer, which will be done on a first-come, first-serve basis, it can enter its message into the computer and simultaneously indicate the message's destination. At this point, address codes, specific to each cable system, will be introduced directly in front of the message prior to its insertion in the vertical blanking interval. After the message is downlinked from the satellite, these address codes will alert the appropriate decoders to the arrival of the message and ensure the message's privacy.

Initially, SSS and PIN conceived of the service as a tool for programmers to use to elicit and maintain advertising support. Programmers would be able to utilize the service to inform operators of changes in advertising and programming schedules. In this way, networks could assure advertisers the proper cable audience. Now, however, Klaver envisions the service's future applications extending to other markets—such as newspapers and magazines—and within the cable market itself as well. The service could even develop into an "industry-wide electronic mail box," she speculates.

For the present though, SSS plans to market the service to programmers as a one-way communications link to operators. As a result, the burden of marketing the service to operators will fall on the programmers' shoulders. In addition, SSS intends to meet its Jan. 2 launch regardless of whether it has "one or 50" subscribers, Klaver maintains.

—Constance *Warren*

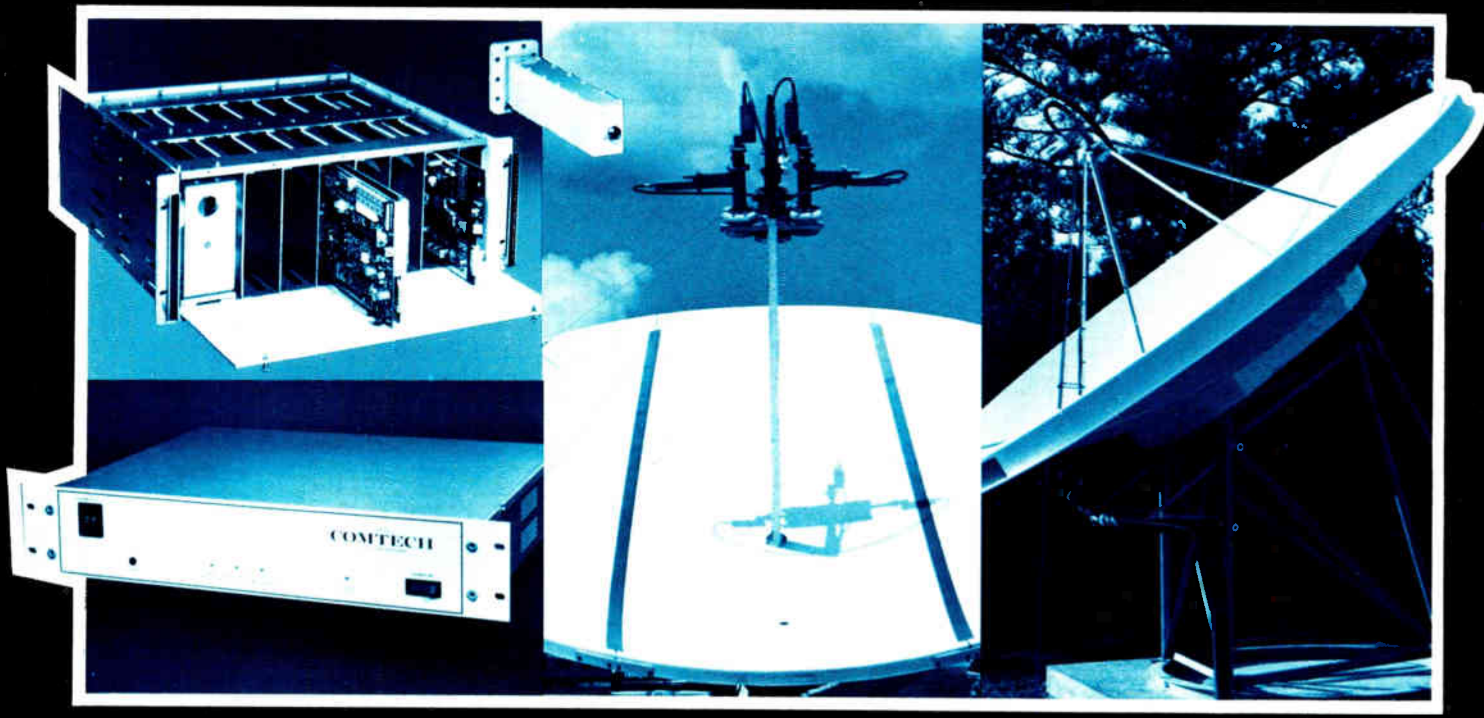
ITT, The Financial Times consider joint venture

ITT and The Financial Times Ltd. of London contemplate venture to offer international business data services

SECAUCUS, N.J.—ITT's value as a company offering businessmen versatile communication tools may increase substantially over the next year, if it decides to proceed with a tentative agreement made with The Financial Times Ltd. of London to establish a worldwide, customer-profiled electronic news service.

This service, which ITT officials unabashedly label as the "first" of its kind, would provide daily news

THE PERFORMANCE PACKAGE



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Performance in Modulators – Our CDM 1155 frequency agile modulator is a low-cost alternative for CATV video/audio headend systems. The CDM 1160 fixed-frequency modulator is the ideal choice for integration into the RCV 750 receiver system.

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Reader Service Number 13


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summaries from *The Financial Times* and other, as of yet unnamed financial publications on any topic specified by the subscriber. More in-depth information would be supplied upon the subscriber's request.

According to the tentative agreement reached between the two firms, ITT would supply the communications link and *The Financial Times*, the information. Satellite circuits and underground cable networks, already being used by two ITT companies—ITT World Communications and ITT Dialcom—would transfer the information from The Financial Times data base in London to subscribers located in some 200 countries. Accessing the service would be accomplished through ordinary phone lines, by dialing a predetermined local phone number. Once the number is dialed, the subscriber automatically would be connected to the service and become eligible to receive information immediately from the data base.

One of the service's greatest assets, and perhaps strongest selling point, is that it can interface with telex terminals as well as with computer terminals and personal computer-modem combinations. With 1.5 million telex terminals in current operation around the world (according to ITT estimates), this feature enhances the service's attractiveness and raises its value in the financial marketplace. As Mike Hughes, an official for ITT Communications and Information Services, underlines, "the beauty of the service is that it makes use of existing equipment already in the office."

As a tool that apprises the businessman of developments impacting the international financial community, the electronic news service takes into account the businessman's unpredictable schedule and his need for continuously updated information. Once programmed by the subscriber to research a certain subject or set of subjects, the service automatically transmits information related to the subject (subjects) as it appears in *The Financial Times* to the subscriber's receiving device, where the material is stored. The subscriber need not be at his office (or at the terminal) to elicit or receive information: he simply can access the material through his computer's "electronic mail box" upon his return to the office. If the subscriber uses a telex terminal instead of a computer to receive the service, he can read the information printed by the telex while he was away.

Another side benefit the service offers, Hughes notes, is that it "cuts down on the flow of useless information." This reduction in information flow has beneficial repercussions for the businessman who is often burdened with the tedious and time-consuming task of having to search through wads of useless information to find what he wants. By freeing him from this task, the service enables the businessman to optimize his time and improves his productivity.

In this era euphemistically coined: "The Information Age," ITT and The Financial Times' electronic news service seems assured a promising future. Both companies, however, are waiting for a six-month market research effort and trial to be concluded before solidifying their preliminary agreement. These market research efforts, which began Oct. 4, are aimed at determining the potential need for the service, its acceptability among international businessmen, a group described by Hughes as "close knit," and its feasibility. Once these questions are resolved, and provided their results are favorable, ITT and The Financial Times will formalize their partnership and begin implementing initial measures to institute the service. According to Hughes, if the market research adheres to its schedule and meets the criteria for approval of the service, the ITT/Financial Times electronic mail service will become available in mid-1984.

—*Constance Warren*

DBS going institutional

Private Satellite Network inaugurating service to link institutions via DBS technology

NEW YORK—Corporations and non-profit institutions will soon be able to benefit from an institutional DBS service that purportedly will integrate all of an organization's offices located throughout the country into one giant communications network.

This service, referred to by its originator Private Satellite Network Inc. (PSN) as the "institutional direct broadcast by satellite service," will use technology akin to that proposed by several yet to be launched DBS entertainment services to broadcast signals directly from an institution's conference room or studio to its branch offices spread around the country. In this manner, the PSN system will provide an organization with an "affordable" and "convenient" vehicle for instantaneously communicating with its subdivisions, PSN officials claim.

General Instrument's DBS antennas, ranging from four to six feet in diameter, will be used in conjunction with General Instrument receivers to intercept the signal at the receive site. Each private television network will operate on the Ku band and will be uplinked and downlinked from one of Satellite Business Systems' satellites.

Privacy will be protected and confidentiality ensured through the use of a scrambling technique also developed by General Instrument. According to Richard Neustadt, senior vice president and general counsel of the company, unique addresses will be assigned to each receive site and will be sent out directly prior to the encoded signal. These addresses will then inform certain sites that they are authorized to receive the scrambled signal. The appropriate receiver sites will then be able to decode the signal. The advantages to this procedure are duofold: it protects the signal from unauthorized intrusion and also provides the subscriber with a way to determine and control which of its receive sites will be eligible to receive a particular signal.

Another asset, Neustadt continues, is its interactivity. Through the use of a telephone, recipients of the signal can converse with the senders of the signal who are also visible on their TV screens. Senders can respond to recipients' inquiries directly through the network. In this way, an ongoing, uninterrupted and spontaneous discussion between the senders and recipients of a signal can be maintained. While this feature serves little purpose in communications between two parties, it could be quite useful in "conference calls" and other similar types of situations.

Another plus is that the service is relatively "inexpensive," a result, Neustadt maintains, of its use of the Ku band. Since signals transmitted on the Ku band can be received by smaller, less expensive antennas than those signals sent on C-band, the cost of implementing PSN's service is less expensive than the cost of a similar service using the C band. Use of the Ku band also enables the service to avoid many of the frequency clearance problems associated with C-band.

While no private TV networks are yet in operation, contracts with several institutions have been signed. Neustadt refused to identify those institutions but did indicate that construction on some networks was underway and should be completed in time for a launch of the service before year end.

Since "each network we build is unique," Neustadt continued, the cost of the service will vary with each organization and will be contingent upon the amount of branches and centers that need to be reached, the location of the origination site and the amount of use the service will receive.

Although point-to-multipoint networks already have been built by other organizations—Hewlett-Packard, Tandem, ARCO and The Chamber of Commerce's Biznet, to name a few—PSN says its system is the first institutional DBS service. PSN bases its claim on the technology it will use, which supposedly is more sophisticated than the DBS equipment employed by earlier DBS networks. Another factor that differentiates the PSN service from what would seem to be its predecessors is the ancillary, supporting service contained in this package. This service includes installation, maintenance and counseling on how to use the network.

Plato aiming at consumers

Control Data Corp. may utilize cable to offer computer-based training network to subscribers

MINNEAPOLIS—Control Data Corp. currently is investigating the possibility of using cable as the medium to bring its computer-based training network, better known as Plato®, into the homes of customers.

By using the cable network, Control Data could extend its customer base to include the consumer, the person whom Bill Slaberg, industry manager of manufacturing for Plato training and education, describes as "the specialty market person." He defines this person further as the hobbyist, the person who holds advanced degrees and earns somewhere in the neighborhood of $40,000 to $50,000 a year.

While the cable distribution system is a viable network in which to transmit Plato, Slaberg explains, the homeowner's TV does not offer high enough resolution for the courses to be legibly reproduced on the TV screen. This problem can be overcome, Slaberg continues, by using a personal computer instead of a TV set to visually produce the transmitted Plato signal. The homeowner's personal computer can easily be connected to the cable distribution system at the switching box located outside his home.

Control Data currently is negotiating a plan for Plato's distribution through the cable network with a cable operator whose identity Slaberg declines to divulge. Right now, both are busy "sizing up the market." One condition that may limit Plato's application in the cable market, however, is that it can only operate in two-way interactive systems. Since very few cable systems presently possess two-way interactive capability, Plato's ability to reach potential customers through the cable network, if implemented today, would be severely impaired. As more systems upgrade to two-way capability, though, this barrier will be obviated.

As far as replacing the phone with the cable network for business purposes, Slaberg does not assign that idea much probability. Most businesses, he says, are currently geared to operate with phone lines as the conduit for receiving information and data and, as a result, are unlikely to make the necessary investment to convert to cable when they can just as easily access Plato through equipment they already possess.

Control Data's involvement with cable, however, is not limited to the cable distribution system. The company currently offers electronic training courses for cable technicians. These courses are designed to educate the technician in digital and basic electronics and to bring him up to par on the technological advancements that have been integrated into the cable system. Through the use of these courses, cable systems can bring all of their technicians up to an equal level of skill and knowledge. Another advantage to this course, which is shared by all Plato courses, is that it requires no traveling or changes in employee work schedules. Employees need only have access to a terminal that can hook up with the Control Data computer to take the course whenever they want, at their own pace.

Download

■ **Insource Corp. has been formed to provide home and business videotext services, cabletext, public information terminals and advertising sales.** The company already has launched its Dallas videotex system and plans to become a national videotex system provider, with plans to operate 43 franchises by 1993. HVC Corp., a privately-held company in Dallas, has licensed its completed videotex system technology to the company and will continue to provide research, development and market test services for the firm.

■ **On Sept. 29, the FCC began the first in a round of monthly lotteries for awarding low power television construction permits.** On Sept. 15, the FCC had announced a moratorium on the filing of applicants for all three tiers.

■ **Merrill Lynch Futures Inc. has introduced AgriStar, an agricultural videotex service that provides daily market research data on ten commodities.** This new service consists of data collected by Merrill Lynch Futures research analysts and includes information on the daily outlook of wheat, corn, soybeans, cotton, cattle, hogs, T-bills, GNMAs, gold and heating oil.

■ **Lencomm Associates has recently been formed as a telecommunications consulting firm based in Manhattan, N.Y.** This new firm will represent electronical construction and cable/broadband related industries. Leonard Cohen, the head of the firm, has 32 years of experience in cable

■ **Control Data Corp. has instituted its own video network that connects 55,000 employees nationwide.** The network consists of a 24-minute magazine format, entitled "TeleNews."

■ **General Cable Co.'s Fiber Optics Division is supplying 9.2 kilometers of a 12 multimode fiber GenGuide® NM (non-metalic) optical fiber cable to the General Telephone Co. of the Northwest Inc.** The order was placed by GTE Network Systems. General Cable's cable will be used by General Telephone as a T3-C (1334 channel) short wavelength optical system linking switching offices in Richmond and North Richmond, Wash. CED

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11/83/CED

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Reader Service Number 14

AppalNet

A Local Area Network for Appalachian State University

By Ron P. Rankins

Telecommunications Analyst
Appalachian State University

Appalachian State University has implemented a broadband communications system that incorporates a whole range of campus-wide applications on two bi-directional, 300 MHz coaxial cable trunks. The university's picturesque isolation gives rise to some communications difficulties, specifically poor reception of commercial and educational television signals and lack of TV or fast data transmission to the outside world or on campus.

The use of ASU's computer center, academic and administrative computer terminals, mini- and micro-sized computers, has grown at an explosive rate during the past decade. Use of leased telephone circuits for computer communications is becoming increasingly expensive while service on these circuits leaves much to be desired.

Appalachian State University has begun development of a computerized energy management system designed for centralized monitoring and control of heat distribution, air circulation and electrical usage in all campus buildings. This application requires digital communication between buildings. Purchase of "voice grade" telephone circuits to all these locations would be a continuing expense.

Detailed study

A detailed study indicated that a broadband communications network could solve a number of communication needs that have arisen as the university has grown: the increased use of computer equipment, a growing demand for management of energy use and a need to improve television distribution. A coaxial cable network allows the delivery of these services to and from virtually any point on the campus at minimal cost. Such a system will support growth in communications services for well over two decades.

3M Company has developed an industrial communication system that combines the concept of cable television with high-density, two-way communications for all kinds of signals: television, digital, data, voice and energy management data.

3M engineers were invited to study university communication needs and develop a proposal for a "Videodata" broadband communications system. The school and system supplier were able to work out an economical plan whereby 3M would design the network and Appalachian State would buy cable direct from the manufacturer and then install the network using its own installation and maintenance resources. This plan saved Appalachian about two-thirds of the cost of installation.

System design

Unlike many institutional communications networks, the Appalachian State University system, called AppalNet, consists of two coax cables rather than one. In terms of signal density, video transmissions require more system capacity per signal than other kinds of signals. One of the two trunks is reserved primarily for video, while the second is to be used for data signals. There is some overlap in use to maximize signal distribution efficiency, and trunk assignments may be modified as time and system use require.

The two coax trunks are parallel, following the same underground duct network, and terminate at the same locations in each building. The network consists of 90,000 feet—over 15 miles—of one-half inch cable that parallels university power and telephone cables. Branches from the main coax run into campus buildings, where they terminate in cable jacks at convenient points for plug-in modems

With the cable network in place, the university has dispensed with the cost and delay of dedicated wiring for every communication device. Appalachian should save thousands of dollars each year for leased lines.

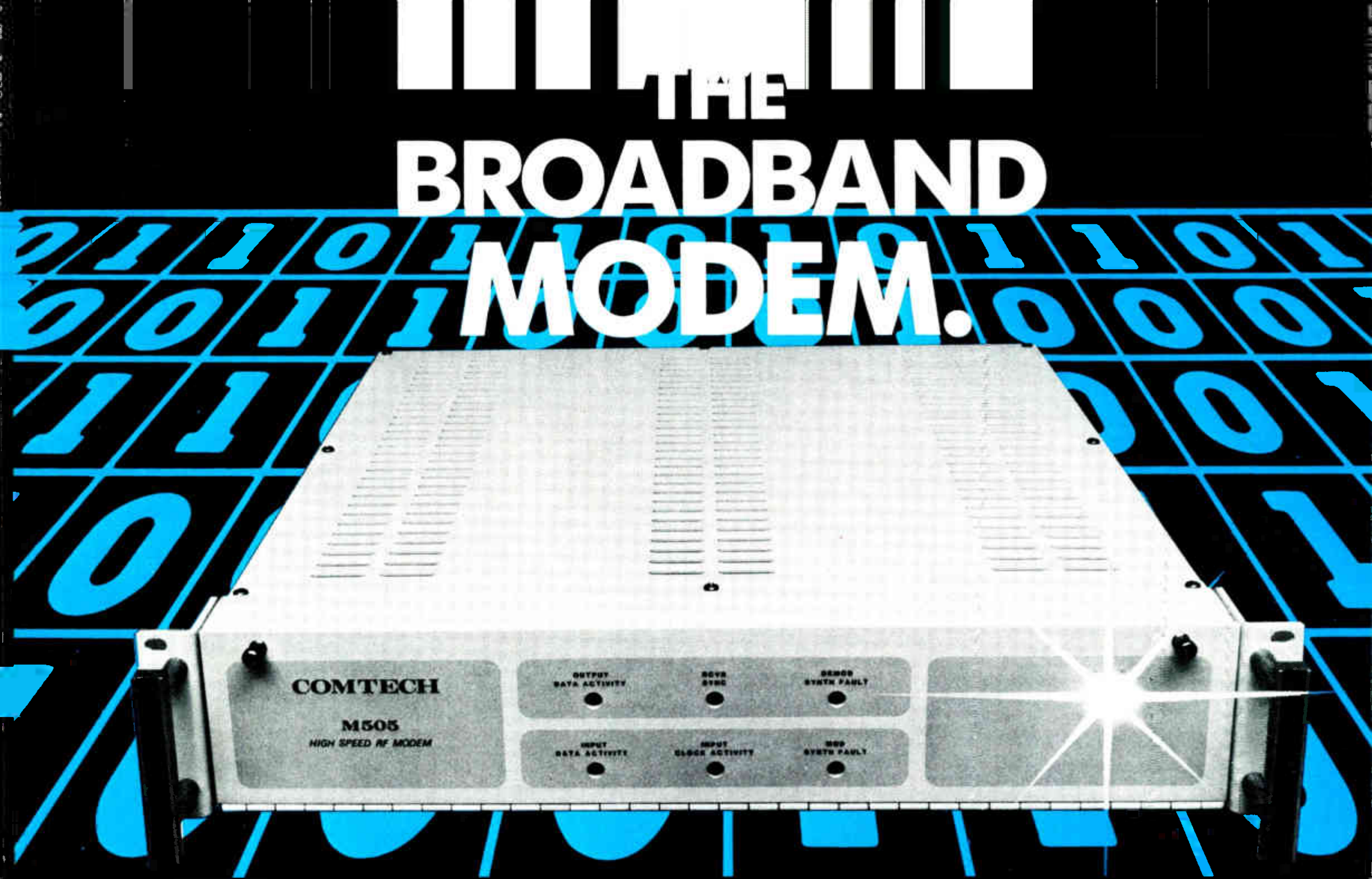
The system design provides for 35 cable television channels across the campus and many hundreds of high speed data channels. In addition, the university is working to develop video and fast data communications on the broadband network in and out of the city of Boone, N.C., where ASU is located, via satellite earth stations and microwave links.

System breakout

AppalNet supports wide-band video, voice and data communications on the Appalachian State University campus via coaxial cable trunks installed in university underground conduit and buildings.

Objectives:

1. Support remote sensing and control of:
   a) building temperature and ventilation
   b) electrical power usage
   c) fire and smoke
   Benefits derived:
   a) savings in fuel oil, coal, and wood costs
   b) savings in electrical energy costs
   c) increased student safety by faster response to fire alarms
   d) savings in operational personnel costs
2. Support to security services:
   a) remote television monitoring of tunnels, walkways, residence areas, classroom areas from central security; and environmental monitoring/control point
   b) remote monitoring of intrusionand vandalism alarms from central security and environmental monitoring/control point
   Benefits derived:
   a) improved personal security for students, staff, and faculty
   b) improved night security
   c) savings in growth of security staff
3. Support of data communications:
   a) provision of data communications via university-owned coaxial cable and modems between academic departments, computer center, and other campus data equipment
   b) provision of data communications via university-owned coaxial cable and modems between computer center, university support agencies, and other campus data equipment
   Benefits derived:
   a) wider access to higher speed and more reliable data communications
   b) reduced cost for University data communications
4. Support of television communications:
   a) distribution of commercial broadcasting signals on campus
   b) distribution of commercial broadcasting signals on campus
   c) distribution of closed circuit signals on campus
   d) retrieval and redistribution of television signals from all areas of the University campus
   Benefits derived:



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Cost Effective—The improved 505 is the most economical high speed digital broadband modem on the market with the most wanted features and the highest through-put.

The 505 can make your coaxial cable or local area network system operate better, faster and more efficiently. Current worldwide applications using Comtech Broadband Modems include: PBX interconnection, CAD/CAM remote graphics, remote terminals, process automation, robotics and data acquisition and control. Let our 505's increase the productivity of your system—call or write: ***Comtech Data Corporation, 350 North Hayden Road, Scottsdale, AZ 85257, (602) 949-1155 or TWX 910-950-0085.***

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Reader Service Number 17

a) availability of television signals in University buildings
b) delivery of instructional materials via television to university buildings
c) retrieval of instructional materials, cultural and social events via television

5. Distribution and retrieval of audio programs:
   a) delivery of audio programs via coaxial cable to and from all university buildings
   b) delivery and retrieval of campus radio programming to and from transmitter and studios

   Benefits derived:
   a) economical delivery of audio instructional, cultural and social materials to and from univeristy buildings
   b) savings in leased phone line costs
6. Support of university telephone and word processing communications

   Use of coaxial cable to deliver telephone communication and intra-word processor communications

   Benefits derived:
   a) wider variety of telephone services available
   b) decreased cost for telephone and word processor intercommunications

Appal seeds

Appalachian's top leadership examined increasing communications needs in the late 1970s and began the discussions that were to lead to design, installation and initial operation of AppalNet during 1980 and 1981. Actual operations began in late 1981 with full scale implementation during 1982 and 1983.

Much interest in coaxial communications preceded this milestone at the university. The period 1960 to 1963 marked the university's first effort at instructional cable television. The link between a local high school and the College of Education eventually failed due to poor technical management and immature CATV technology. However, technological improvements and increased faculty awareness of educational and instructional television techniques during the period 1973 to 1979 led directly to the idea that was to become AppalNet.

The Learning Resources Division of ASU communicated with the faculty during the '70s and evolved a prototype underground cable television proposal, but this design is not yet commercially available. Yet, interest in cable and its diverse applications has been considerable and long-lived on the

Appalachian State University campus. AppalNet is simply the fruition of past attempts and efforts. This parallels the rapid development of CATV during the late '70s and early '80s in urban and suburban communities. Presently, the cable infrastructure is increasing. Devices for and adaptions of cable technology will proliferate during the next decade. Applications previously not feasible via CATV technology, notably telephony, will migrate to cable distribution. The coaxial medium will probably slowly evolve toward fiber optical technology.

Scholastic purpose

Much of the discussion about academic computing is centered not on communications, but on who will "own" the processing and storage resources that support student data processing access. Clearly, low-cost, high-speed communications and a large, shared central processor and database will ultimately provide the most cost effective student access. However, fast, powerful microcomputers are creating a strong interest in departmentally-owned processing and storage equipment. This trend could result in considerable expense and reduced student data processing access.

The real issue during the remainder of the '80s is not on legitimate educational purposes, but rather, cost effective development of a shared system of access to computing resources, instructional and educational media resources and messaging resources. Technically and economically, these can only be provided by an integrated communications and data processing effort. Separate computing and communications systems on a department by department basis would not only be cost prohibitive to construct, they would be impossible to maintain or operate in a coordinated manner.

Technical achievements

Fiscal 1982-83 has seen advancements in telecommunications facilities and staff capability. AppalNet is now connected to over 500 taps across the campus, and nearly 95 percent of all on-campus data communications are AppalNet-supported. Three locally originated television channels are also being distributed, in addition to existing data applications. This year, ASU conducted its first local electronic sweep for system maintenance and provided communications for the university's first comprehensive office automation demonstration, Sperry-Link.

Fiscal 1981-82 marked completion of campus-wide, underground trunk construction and initial system operations. During fiscal 1982-83 the staff has designed, installed, and now operates many building communication systems, supported by AppalNet trunks.

In addition, the AppalNet telecommunications organization at the Physical Plant has equipped and trained a cable maintenance construction staff, created an emergency spare parts inventory, developed technical documentation for trunk and building communication systems and stabilized and refined the existing trunk and headend systems. AppalNet also has added two TVRO antennas to provide cable delivery of C-SPAN and SIN.

Perhaps the most successful adaptation of radio frequency modem data communications support is the integration of Appalachian's Univac 90/80 and 1100 computers with AppalNet via protocol converters. Student computer terminals have been attached to the network in several academic buildings. The "native" Univac communications protocol, Uniscope, is a powerful, error controlling, polling, synchronous bit stream, which is exported to Univac terminals via RF modems. ASU also supports remote protocal converters via RF modems. These converters disassemble the fast Uniscope bit stream into as many as 16 medium speed, asynchronous bit streams, supporting inexpensive "dumb" terminals.

As the understanding of these protocol converters increases, the university believes it can use them as low cost "front-ends" for integration of existing and planned mini-computers via AppalNet and replacement of some "smart," expensive "administrative" terminals with less costly, block-mode, asynchronous terminals, protocol converters, and synchronous, multi-drop RF modems. Microcomputers are being added to departmental inventories at an increasing rate.

University facilities with lower concentrations of terminals, or diverse host, terminal and remote data base interconnection requirements pose a difficult problem. The Physical Plant staff is investigating smart RF token passing modems for these demanding applications.

Library automation planning has produced two possible terminal support methodologies. A Univac 1100-based library automation system would be supported via Uniscope protocol, multi-dropped RF modems, protocol converters and asynchronous terminals. Token passing modems would be used in this application if the number of terminals per patron or staff access point was below eight terminals. The per port communication cost will determine the method employed. CED

Adding business communications to subscriber and institutional cable

By Bradford Anderson

President Wideband Data Corp.

During the last few years, we have all witnessed high levels of activity as manufacturers have rushed to develop hardware and systems for the local area network marketplace. Many of these networks are intended for use in broadband coaxial cable environments such as CATV. As cable television operators and engineers, we hold the communications resources that many have clearly identified as the means through which high capability, low cost business communications will be conducted. It has become obvious to us that in order for substantial business revenue to be derived from our CATV resources, we the CATV industry must create and cultivate a partnership between the data processing and communications community. This partnership is based both on business and engineering.

The purpose of this paper is to describe the interrelationship between the CATV and the data communications environment and to provide some ideas that can serve as the foundation on which a marketing methodology can be established to add business communications to subscriber and institutional cable. During many contacts with data processing users interested in CATV distribution, as well as CATV operators interested in tapping the business communications marketplace, it has become evident that there exists a major gap that must be bridged. Contact must be established between members of these two communities, then technical information must be exchanged, and finally a business relationship must be created.

Two-way advantage

The CATV spectrum environment generally extends from about 5 MHz up to about 500 MHz, although this varies from system to system. It is this spectrum that the CATV system operator has to offer the user community. In conventional subscriber systems, much of this spectrum is consumed by broadcast television transmission. However, there is nothing inherent in the hardware that prevents the system from carrying data and voice communication as well as video.

The basis of non-broadcast communications in the CATV environment is the two-way CATV system. This system carries signals from the headend to the end user as in conventional subscriber television systems, but in addition carries signals from the subscriber back to the headend.

In a tree architecture CATV distribution system, the downstream channels operate exactly as they do in a conventional subscriber CATV system. The upstream channels follow in the reverse path and are collected and concentrated to the headend. At any instant in time, each signal has its own frequency. Once at the headend, the frequency of the signal will be changed to a suitable downstream channel and the signal will be rebroadcast to the receiver. As long as each circuit has its own frequency, the number of concurrent circuits is limited only by signal levels and interference products, as well as potential noise build-up due to ingress accumulation in the reverse channels.

Based on the desired application, cable systems are constructed to carry a certain portion of the frequency spectrum to the subscriber nodes and some portion from the nodes. Most cable systems accomplish this by splitting the frequency spectrum of a single cable; however, separate forward and reverse cables are constructed for some dedicated institutional applications. The sub-band split system, which is primarily used for subscriber applications, allocated most of the bandwidth to forward channels for television services. This leaves relatively little bandwidth for added business two-way services, because two-way services require bandwidth in the reverse direction, which is at a premium in such a configuration. Mid- and high-band systems have more reverse bandwidth available, at the expense of broadcast type services.

The selection of a particular frequency split or cable configuration will have a substantial effect on the amount of information that can be sent in either direction. For a two-way point-to-point service, the upstream information must be duplicated on a corresponding downstream channel so that it can be received by the intended user. If the amount of upstream bandwidth is restricted, as in a sub-split system, this will limit the total amount of information that can be carried on the system. This is why most single-cable institutional systems are of the mid-band split variety.

The data environment

Although most CATV systems are built around a tree architecture, this sometimes may not provide an optimum solution for the business data environment, particularly where a dedicated, single-customer system is involved. The tree architecture, often called a bus, distributes the headend-originated signals to every point on the system and conversely collects upstream signals from every point on the system, with each signal having its own frequency. Alternative architectures, including a ring, which follows a circular layout, and a star, which feeds each node directly from a central source, find some application in local area networks, but these are generally not suited to the general purpose CATV environment.

The CATV-based business communications system consists of the CATV distribution network and its headend, the user devices that are serviced by the network and interfaces to connect the user devices to the distribution network.

At the headend, a transverter is generally used to relay information collected on upstream channels to the downstream broadcast channels.

The simplest approach to the conversion problem is to utilize a block converter type transverter. This is a simple frequency converter that accepts a rather broadband of input signals and converts these to a similar band in the downstream frequency range.

A somewhat more common approach to providing transverter services is to use a CATV-style heterodyne processor that is set up to convert a single 6 MHz area of the spectrum from an upstream channel to a corresponding downstream channel. This is still a conversion approach, but, the conversion is performed at the channel level, which is often a more convenient unit of spectrum to work with.

An extension of the channel-level

conversion approach involves actually demodulating the incoming information and regenerating the data on the downsstream channel by remodulation. This approach is particularly useful in the digital environment where as a by-product of the demodulation, the digital signal's timing and signal level relationships are completely restored, thus eliminating low-level noise accumulated during transmission to the headend. By making the digital signal directly available at the headend, further processing can easily be performed for a wide variety of purposes using readily available data processing equipment.

The data modem

The data modem is the fundamental component required to carry digital information on a cable distribution system. A modem generally performs two separate and generally independent operations—modulation and demodulation—creating a full duplex circuit where independent information can be simultaneously received and transmitted. There are many varieties of modems, intended to serve particular applications and types of data equipment. The most important issue in selecting modem equipment for a customer is to ensure adequate compatibility between the customer's equipment and the modem.

Modems, particularly packet-switching types, often can be obtained with several independent user ports. In such a configuration, the relatively expensive RF circuitry is time-shared among several users under control of a built-in microprocessor. This configuration represents an extension of the multiplexer familiar to users of telephone data transmission equipment. A major additional feature of many such modems is their ability to perform autonomous switching, which can facilitate construction of a completely decentralized communications network.

Seeking customers

The four basic steps leading to implementation of a CATV-based business communications system are: 1) making contact with the potential customer; 2) identifying the customer's requirements; 3) identifying the resources that will solve the customer's problems, both from a technical and economic viewpoint; and 4) reducing the accumulated information to a coherent plan for implemention.

The process of making contact with a potential customer is perhaps the least well defined part of the job. CATV operators and business communications users are not traditional partners, and the avenues of contact are few. There are few set rules because the size and nature of both vendors and customers vary greatly. A good starting point is to identify who the potential customers are, which can be fairly readily determined by examing the geographical area covered by the CATV system. Likely places to start include those operations that employ data processing systems including banks, insurance companies, hospitals, airlines, businesses that have several regionally located facilities and local and federal government facilities. A relatively easy way to judge a potential customer's requirements is to get a feel for how many user terminals are served in a facility. A large building full of computer terminals is an ideal candidate for cable. It is a good idea to get an early start by approaching builders and architects so that cable can be wired into buildings from the start.

Once contact is made and interest in exploring CATV-based communications is shown, the next step is to identify the customer's requirements. If the customer has existing facilities, the first part will involve obtaining a complete summary of these facilities. Of particular interest is the exact nature of the equipment, its application, the location of the equipment and the paths of communications that currently are used. It is most likely that the customer will want to retain the existing equipment even if new equipment and communications systems are to be introduced. It is the existing equipment and that which is planned for in the immediate future that has the most impact on what kind of cable interface hardware is to be installed.

The next step is to determine what the customer foresees as the maximum configuration for the system. There are clearly uncertainties present, particularly considering how quickly data processing and communications equipment evolves. Fortunately, the actual equipment does not affect, to a great degree, the cable plant itself.

Once the detailed requirements are determined, the next step is to match these requirements to available hardware and bandwidth resources. These two factors interlock, and as such should be handled together. The hardware may consist of a partial or complete cable plant in addition to interface hardware. Often, several vendors will work jointly, with one specializing in cable plant installation and another specializing in interface hardware. For a complete turnkey system, yet another vendor whose specialty is data processing systems may be involved.

Installing data networks

The actual implementation of a CATV-based system will typically occur in

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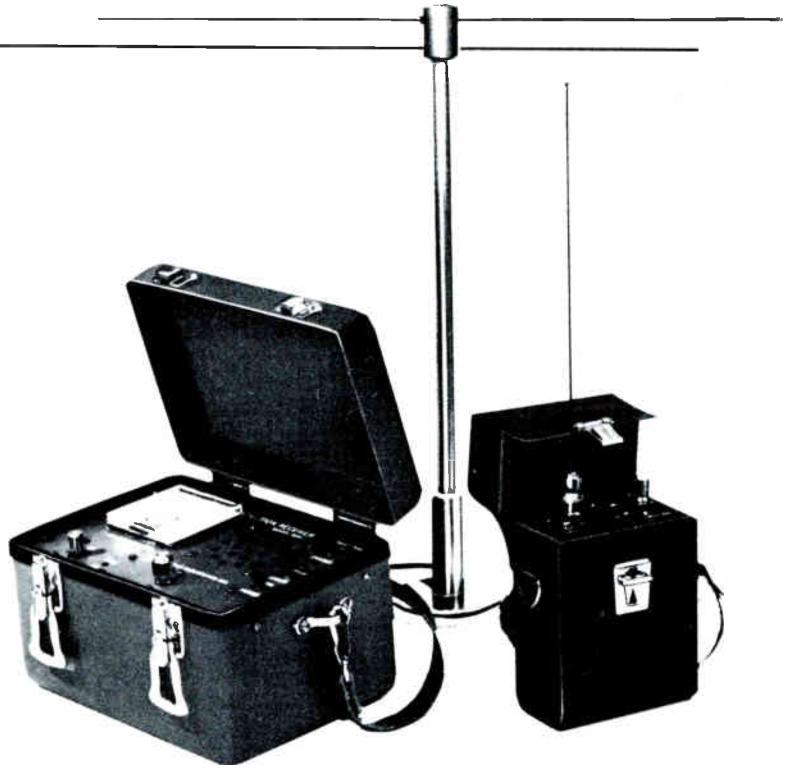

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several stages in order to minimize system downtime and risk. The first stage is typically the construction of the cable plant or the addition of new connections to an existing plant. Once the cable system is installed, the user hardware can be attached to the cable. This typically will occur gradually, with more and more of the customer's communications being placed on the cable as confidence in the system's performance improves with experience. Often the customer will want to start with a pilot system—which runs parallel to existing facilities—so that the risk of major incompatibilities can be avoided.

The arrangement made between the vendor and the customer in connection with the interface hardware, including modems, special headend hardware, and so on, is generally driven by customer requirements. Interface hardware for the business user is far more varied than the simple set-top converter usually offered to the residential subscriber, and for this reason the management of such hardware may well be beyond the scope of the cable system operator's activities.

Given that the CATV operator's real property lies in the bandwidth that is offered to customers, the process of assigning value to this property is of vital importance to the success of the business. The two fundamental parameters are the amount of bandwidth consumed and the time during which that bandwidth is consumed. For users where bandwidth is continually consumed by one customer, the process is the amount of bandwidth used. In the packet-switching environment where many customers may share a given segment of the spectrum, the process can be far more complex. Again, the basic factors are bandwidth consumed and time. If service is to be measured, a straightforward approach may be a mechanism at the headend that monitors each packet that is transmitted and performs a billing operation in a manner similar to the way the telephone company bills for long distance calls. An alternative to this may be to assign a periodic fee for the connection of a device to the network, where the parameter is not the amount of spectrum the device actually uses, but rather the amount it could potentially use. In this way, a low-speed device might cost less per month to connect than a higher-speed device. The primary considerations in selecting a suitable method of billing for bandwidth used will be drawn from customer requirements, the potential for administrative overhead and the accuracy with which each user of the system can be made to share their portion of the system operation. CED

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Communications Engineering & Design

TECH II

CED's feature supplement and Product Profile

November 1983

An introduction to data transmission

Product profile: Modems

Ungermann-Bass 640 broadband modem

Data Applications for broadband cable

A definition of terms

For some engineers in the cable industry, knowledge of modems and data transmission/business communications operations is a necessary part of their responsibilities within the cable system. There are many flagship systems in the U.S. where data transmission services are available for the business community and individual subscribers for various applications. And all indications are positive that this rather elite group will soon be joined by many other cable systems as operators begin to acquire the information and knowledge on the applications of business communications.

But for the majority of cable systems operating in the U.S., data transmission may be only a concept of which operators are aware, with little practical use for the present. In some cases, operators may not know appropriate definitions and applications of data modems for their industry. There are numerous data transmission courses and seminars around the country, sponsored by a variety of different organizations and companies, but for the cable operator and the engineer, who want to learn about this intriguing new business opportunity, perhaps a beginning course or at least a quick cram of terms and models is required as the initial step. For that reason, we present Scientific-Atlanta's "Definition of Terms for Data Communications via Broadband Cable," authored by David Slim of the company's Distribution and Data Products Division. Slim has prepared a comprehensive study of data communications for cable television, but space limitations here prevent reproducing the two pamphlets in their entirety. They may be acquired by writing Scientific-Atlanta Inc., Data Products Division, Dept. AR, Box 105027, Atlanta, GA 30348. Request Application Notes I and II.

Data transmission: An introduction

Virtually all "digital" devices, such as calculators and computers, and their peripherals (cathode-ray-tube terminals and printers, etc.), rely for their operation on circuit elements which use the Binary system to represent numerical values and instructions. This system is ideally suited to electronic devices, since individual components need to handle only two possible electrical conditions. A transistor, for example, could process a binary '0' by being in a saturated (full conducting) condition, and the same transistor could process a binary '1' by being completely biassed off. There are no intermediate states.

When the digital devices must communicate with each other or with their peripherals, it is natural to use the same binary form of data respresentation, and if the rate at which communication takes place is very low, say just a few binary digits per second, then the signals can be quite adequately handled using straight-forward wiring between the devices. However, when the transmission speed increases (a figure of about 10,000 binary digits, or 'bits' per second is commonplace), or when several peripherals need to communicate with a single computer simultaneously, the job of interconnecting the devices ceases to be a simple matter of stringing up some plain copper wire; it becomes a part of the increasingly complex field of Data Communications.

To complicate matters, consider the problem of interconnecting several computers and peripherals over large distances, when only a limited amount of wiring is available. Clearly, two or more data signals cannot be conducted along a single link; the spectra would overlap and the received signal would be indecipherable. This is in fact the situation in our present "information age." What is needed is a means of converting large numbers of data signals into a form more suited to long-distance communications.

Data modems

The problem of conveying several data signals along a single conductor can be solved by modulating each signal onto its own carrier, thus creating a Frequency Division Multiplex (FDM) scheme. Using suitable modulation techniques, the bandwidth requirement of each signal can also be circumscribed. The basis for most data transmission is the Frequency Shift Keying (FSK) system, in which the frequency of the carrier is displaced between two discrete extremes as the pattern of '1's and '0's is applied to the FSK modulator. Alternatively, the phase of the carrier can be shifted, relative to the quiscent state, as the data pattern is applied. Causing the carrier to shift $+90^{\circ}$ for a '1', and -90° for a '0' gives rise to the Bi-Phase Shift Keying System (BPSK). A more sophisticated technique makes use of Quadrature-Phase Shift Keying (QPSK) in which the data is sampled in 'batches' of two bits, and the phase of the carrier is shifted into one of four possible states. Using advanced methods of modulation and bandlimiting filters, it is possible to transmit a data signal in a bandwidth of about half the fundamental bit-rate.

Since most devices must receive as well as transmit data, demodulators are also required, and since both modulator and demodulator are usually housed in a single box, we have defined a MODEM: MOdulator-DEModulator.

The existing transmission medium

The U.S. public telephone system is a vast, complex communications network which reaches into almost every home and office in the country. Like all other telephone systems, it was developed, and continues to evolve largely around the need for rapid, good quality voice communications between subscribers, and in providing this capability it has proven dramatically successful. Quite possibly, it is the finest telephone system in the world. The human voice, however, occupies a relatively small range of frequencies.

But, with all this equipment in place, and with a "twisted pair" leading into most business offices, it is logical to consider the telephone system as a medium for data transmission, and indeed the telephone operating companies can provide modems which interface digital devices with "voice grade" telephone lines. (Independent manufacturers also offer modems fully compatible with telephone company standards, which can be purchased, rather than leased by the subscriber.) The fundamental difficulties with this means of data transmission, however, are the bandwidth limitation of the wiring between the subscriber and the telephone system's local office, and the problem of quaranteeing a low error-rate in a system which contains a great deal of switching, multiplexing and demultiplexing equipment. It is possible to lease or buy a modem which will convert a 9.6 kbps (thousand bits per second) data signal into a form suitable for transmission over a "voice grade" telephone line, but the costs of the sophisticated modem and a good quality, "conditioned" telephone line are high.

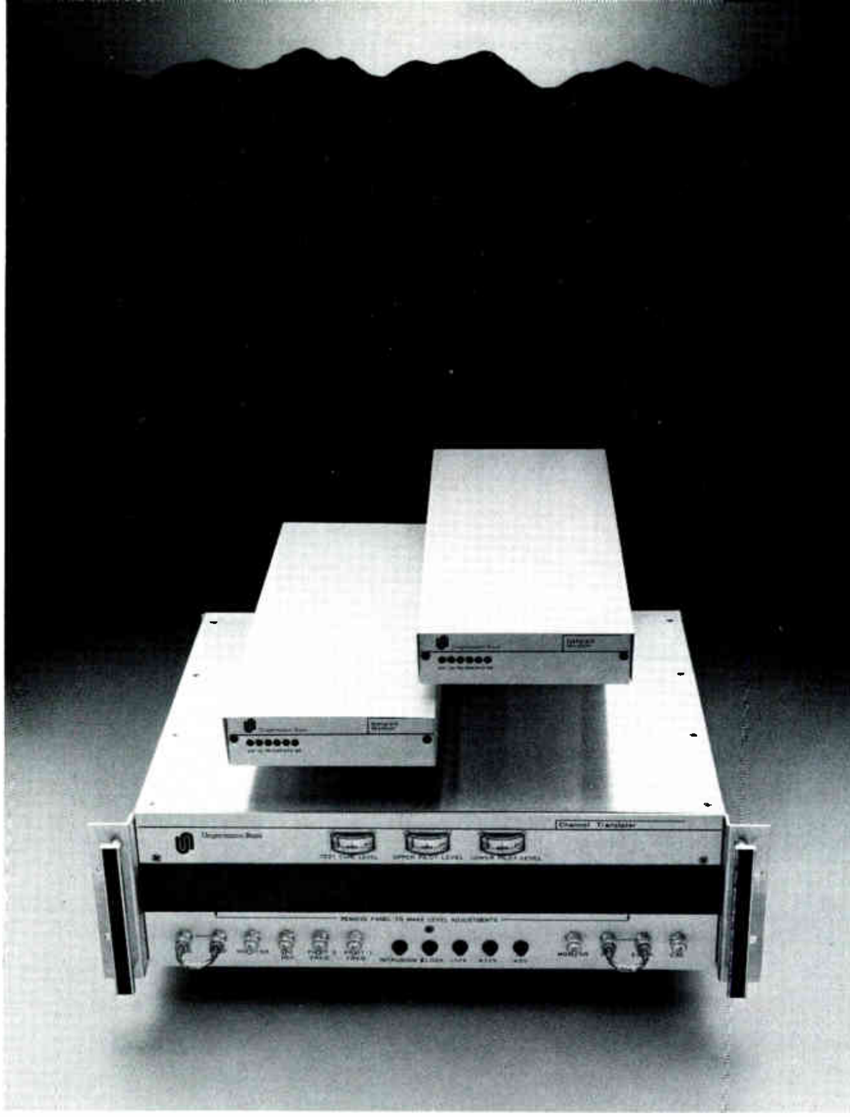
An alternative: broadband cable

Cable television systems are designed to handle a broad range of frequencies. Many new installations are capable of carrying 54 television channels in a total bandwidth of 400 MHz, and each subscriber has access to this spectrum through the coaxial cable which links the home or office to the distribution system.* Furthermore, CATV equipment is already equipped for, or can be readily adapted to two-way operation using the "sub-split," "mid-split" or "high-split" format and has a reserve of bandwidth not currently allocated to active television programming. Some system owners have installed so-called "institutional" cables alongside the standard TV distribution system to serve the needs of business and educational facilities as part of their franchise agreements. In other words, wherever a CATV system is installed, there exists the potential for a data communication system possessing the most desirable characteristics of high speed, high density and easy accessibility.

Modems for broadband cable

In order to design and build modems that will connect directly to existing cable television systems, it is necessary to understand the physical layout and spectrum allocations of typical installations. The figure below is a schematic representation of a 35-channel, sub-split CATV distribution system.

Suppose that at point 'A' there is a bank branch office equipped with a data termnal (CRT and keyboard) which must communicate with the master computer located in the head office at point 'B.' The data terminal at 'A' is connected to a modem which can transmit onto, and receive from the distribution system, and the master computer at 'B' is



Here's all you need to turn your CATV cable into a data communications network.

If you already have CATV broadband cable installed, you're very close to having a data communications network. All you need now are high speed, point-to-point broadband modems from Ungermann-Bass.

Synchronous or asynchronous two-way operation at up to 19.2, or 56 Kbps. Point-to-point or multi-drop connections. Thousands of these modems are delivering trouble-free, easy operation in installations of all kinds: host-to-terminal, office-to-office, building-to-building—anywhere fast, dedicated data communication is an advantage. Anywhere, for example, you're now leasing expensive phone lines for point-to-point communication when CATV access is available.

If you already have a switched broadband network going, our high speed modems are an inexpensive, efficient way to augment your 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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Reader Service Number 26

In Control!

The Magna 6400 Addressable Converter System is a cost-effective means of providing maximum signal security. The system's key feature is Encryptic Encoding™, a sophisticated scrambling method combining advanced digital techniques with proven RF circuitry. Encryptic Encoding is fully dynamic – you can change the authorization code on a random basis.

All components are synchronized from the system controller. This total integration prevents non-system components from defeating the system.

Besides improved security, the Magna 6400 Addressable Converter offers you and your subscribers features like:

- Parental Control Code
- Parental Control on Any or All Channels
- Directory Channel
- Forced Tuning of Unauthorized Channels
- Last Channel Viewing

For more information on Magna 6400 addressability, contact your Magnavox account executive or call toll-free 800-448-5171 (in New York State 800-522-7464).

Magnavox CATV SYSTEMS, INC.

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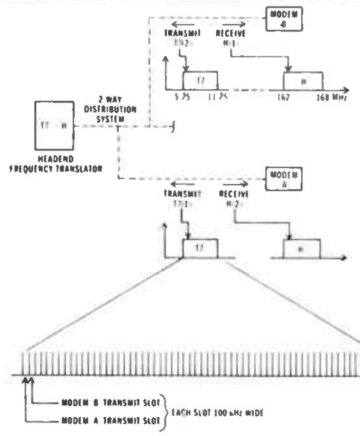
Reader Service Number 27



Frequency assignments for a typical CATV modem pair.

similarly connected. It is clear that there is no way in which a signal can travel directly from 'A' to 'B' using the route LE-2, TA-2, TA-3, LE-1, or vice versa. Any signal in the range 5-30 MHz will travel only toward the headend, and any signal in the range 54-300 MHz will travel only away from the headend. However, the addition of one simple device at the headend will solve this problem, and also allow great flexibility in connecting additional customers to the system.

The device is a frequency translator, which receives signals at the headend in the 'reverse' frequency range and 'translates' them to the 'forward' frequency range. It can be designed to translate a single 6 MHz channel or several channels, depending on the amount of traffic and the availablity of unoccupied channels. In fact, it is very similar to a standard headend signal processor. Therefore, when 'A' wishes to send a message to 'B,' 'A's' modem transmits at a frequency in the range 5-30 MHz. The signal returns to the headend, where the translator shifts it to an available channel in the 'forward' spectrum. 'B' can then receive the transmission.

Using Bi-Phase Shift Keying (BPSK) as the modulation scheme, one may expect to transmit a 19.2 kbps data stream in a bandwidth considerably less than 100 kHz. To allow for a certain safety margin, however, one must assume that 100 kHz includes the amount of "elbow room" required by each modem. A quick calculation shows that a single 6 MHz TV channel could support transmissions from 60 such modems, and by this simple reckoning, the operator is confronted with the great potential of broadband CATV systems for data communications.

Transmission in the opposite direction, from 'B' to 'A,' must make use of a different sub-channel. This is because both modems may be required to transmit and receive simultaneously, a very common situation which is referred to as "full duplex" operation. Therefore, modem 'B' transmits in T7(2), and modem 'A' is tuned to receive H(2).

To summarize, a pair of modems operating in full duplex mode require the allocation of two sub-channels in the 'reverse' frequency range and two corresponding sub-channels in the 'forward' frequency range. In our hypothetical example, this is equivalent to 200 kHz in channel T7, and 200 kHz in channel H. It follows that, if all the sub-channels in T7 and H were allocated, the system could support full duplex communication beween 30 pairs of modems. CED

* Most offices do not, of course, have cable television installed for entertainment purposes. However, in many cases the distribution system is accessible via drop cable, or by extension of a feeder.

Data modems

Model	Operating mode	Operating channels	Data format	Data rate	Data circuit spacing	Bit error rate
C-COR 7130	Full duplex, simplex, multi-drop	Transmit: T-7—T-13; receive: T-11—T-13	Asynchronous	300, 1200 2400, 4800, 9600, 19000 baud	(Channel) 25 kHz/ 300-9600 baud, 50 kHz 19.2 kbaud	1 part 10 -8 @ 16 dB C/N (9600 baud)
Comtech M500C	Full duplex	Independent transmit & receive frequencies in 5—440 MHz	Synchronous	56 Kbps—3.088 Mbps; 3.088—6.5 Mbps; or 6.5 —10 Mbps	100 kHz	1 x 10^{-9} for 30 dB C/N and an adjacent channel carrier 10 dB higher
Comtech M500	Full duplex	Same as Comtech M500C	Synchronous	Same as Comtech M500C	100 kHz	Same as Comtech M500C
Concord Data 71801	Compatible with mid-split single or dual cable	Transmit: 3', 4', 4a', 5' and 6; receive: P—T	Synchronous or asynchronous	5 Mbps	N/A	Less than 1 in 10^{8} bits @ S/N of 20 dB
E-COM TRM 159	N/A	(Can be configured for 5-350 MHz)	Serial synchronous binary	From 9.6 KB/s—1.5 MB/s	N/A	N/A
E-COM TRM-202	N/A	(Can be specified for 0—250 MHz)	Binary serial asynchronous or synchronous	50, 75, 110, 134.5, 150, 200, 300, 600, 1200, 1800, 2000, 2400, 3600, 4800, 7200, 9600 bps	(Channel) 200 kHz typical	$< 10^{-7}$ @ 30 dB min. C/N
General Instrument Metronet 1000	Full duplex, half-duplex	See manufacturer	Synchronous or asynchronous	110, 150, 225, 300, 450, 600, 900, 1.2K, 1.8K, 2.4K, 3.6K, 4.8K, 7.2K, 9.6K, 14.4K, 19.2K bps	50 kHz	Min. 10E-10, @ 26 dB S/N ratio
General Instrument Metronet 1600	Compatible with sub-, mid-, and high-split and dual cable systems	Transmit: T-7—1A; receive: H—13, 11—0	Synchronous	1.544 Mbps	N/A	10^{-8} @ 25 dB S/N
Phasecom 401	Full-duplex and half-duplex	Reverse: T-7—A-2, A,B,C, forward: 11,12, 13, J—0, AA-EE	Synchronous or asynchronous	110, 150, 225, 300, 450, 600, 900, 1.2K, 1.8K, 2.4K, 3.6K, 4.8K, 7.2K, 9.6K, 14.4K, 19.2K bps	50 kHz	10E @ specified input level
Phasecom 425	Suitable for dual and sub-, mid-, IEEE-802 split single cable	Covers 50—440 MHz and subband channels	Synchronous or asynchronous	1.544 Mbps	N/A	10^{-13}
Scientific-Atlanta 6402	Full duplex	Transmit: 5-120 MHz; receive: 162-440 MHz	Synchronous	1.544 Mbps	750 kHz	$< 10^{-9}$ @ C/N $\geq$ 33 dB
Ungermann-Bass NM-640	Simplex, full or half-duplex	Reverse: T-7—2-A; forward: H—13	Synchronous or asynchronous	110, 150, 225, 300, 450, 600, 900, 1.2K, 1.8K, 2.4K, 3.6K, 4.8K, 7.2K, 9.6K, 14.4K, and 19.2K bps	96 kHz	$< 10^{-8}$ @ 24 dB C/N ratio
Ungermann-Bass MN-670	Simplex, full or half duplex	T-7/H; T-8/I; T-9/7	Synchronous	56Kbps	192 kHz	1 x 10^{-8} @ required C/N ratio
Wang DX 9600	Simplex, full or half duplex	Reverse: T-7—T-13; forward: H, I, 7-11	Synchronous or asynchronous	up to 9600 bps	25 kHz	1 x 10^{-8} max. @ 24 dB C/N ratio
Zeta Labs Z19	Full or half duplex	Transmit: T7-T14, IF; receive: H, I, 7, J, K, L, M, N, IF	Synchronous or asynchronous	0—19.2Kbps	(Channel) 50 kHz	10^{-8} @ 25 dB S/N

Spurious level	Required C/N ratio	Transmit level	Receive level	Carrier detect level	Image rejection	Power
60 dB below carrier output	16 dB	+15—+45 dBmV	-25 dBmV, all products, 50—450 MHz	-20—+20 dBmV (adjustable)	40 dB	105—127 VAC, 50/60 Hz, 10 watts
-40 dBc	30 dB	(Modulator) -30—+45 dBmV, adjustable	(Demodulator) -12—+5 dBmV, AGC controlled	N/A	N/A	117 VAC ± 10%, 50 optional, 50 watts max.
-40 dBc	30 dB	(Modulator) +30—+45 dBmV, adjustable	(Demodulator) -12—+5 dBmV, AGC controlled	N/A	N/A	117 VAC ± 10%, 60 Hz for—002 module: 230 VAC ± 10%, 50 Hz for—003 module; 120 watts max.
N/A	(S/N: 20 dB)	+30—+50 dBmV, adjustable	N/A	N/A	N/A	115/220 VAC, 50/60 Hz, 60 watts
N/A	(S/N: 30 dB min. in band-width in Hz = bit rate in bps.)	+50 dBmV min.	-68 dBmV +10 log (bit rate): +20, -6 dB	N/A	N/A	110/220 VAC ± 10%, 50/60 Hz, 50 watts max.
N/A	30 dB min.	+40 dBmV min.	-20—+10 dBmV	N/A	N/A	115 VAC ± 10%, 60 Hz, 5.8 watts
N/A	(S/N: 26 dB)	+30 dBmV factory set; +15—+35 dBmV, adjustable	-16 dBmV ± 10 dBmV	-16 dBmV factory set; 0—-30 dBmV, adjustable	50 dB min.	117 VAC ± 10%, 60 Hz
-50 dB max.	(S/N: 25 dB)	+40 dBmV +10-15 dB, adjustable	0 dBmV ± 10 dB	N/A	50 dB Min.	117 VAC ± 10%, 15 watts
N/A	N/A	+30 dBmV, +5, -15 dB, adjust-able stability	-16 dBmV +10 dB	N/A	>50 dB	117/220 VAC, 60/50 Mz
-60 dB	N/A	+35—+60 dBmV adjustable	-5—+15 dBmV	N/A	N/A	117 VAC, 50/60 Mz
N/A	≥33 dB	+20—+50 dBmV	-10—+10 dBmV	N/A	N/A	115/230 VAC ± 10%, 100 watts, 50/60 Hz or -48 Vdc
N/A	36 dB per FCC regula-tions	+35 dBmV, + 5 -15 dB adjustable	-10 dBmV ± 10 dB	-26 dBmV, -9, +16 dB, adjustable	N/A	115/230 V units, 50/60 Hz
N/A	36 dB measured in 96 kHz	+35 dBmV +0, -15 dB, adjustable	-7 dBmV ± 10 dB	-25 dBmV -10, +15 dB, adjustable	N/A	115/230 V units, 50/60 Hz
-40 dBc min.	24 dB	-15—+35 dBmV, adjustable	-26— -6 dBmV	-41 dBmV, adjustable	40 dB min.	110/230 VAC, 50/60 Hz, 25 watts
50 dB below carrier	(S/N: 25 dB)	+40 dBmV, factory set; +30—+50 dBmV, adjustable	N/A	(Receiver/ demodulator sensitivity specified @ -20 dBmV)	N/A	120 VAC ± 10%, 60 Hz, 0.1 a

THE WESTERN SHOW

Booth guide

December 13-15, 1983 Anaheim convention center

— A —

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Washington, DC
Booth: 1118

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Fort Worth, TX
Booth: 1360

ADT Security Systems
New York, NY
Booth: 904B

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Sioux City, IA
Booth: 787

Allied Steel & Tractor Inc.
Solon, OH
Booth: 990

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Bellingham, WA
Booth: 755

AM Cable TV Industries, Inc.
Quakertown, PA
Booth: 1340

Andrew Corporation
Orland Park, IL
Booth: 222

Anixter-Communications
Skokie, IL
Booth: 425

Antenna Technology Corp.
Scottsdale, AZ
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Arko Equipment Inc.
City of Industry, CA
Booth: 384

Armex Cable Corporation
Warren, MI
Booth: 217

Arthur Anderson & Co.
Los Angeles, CA
Booth: 204

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Booth: 740

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Los Angeles, CA
Booth: 340

Augat Broadband Communications
Horseheads, NY
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Avantek, Inc.
Milpitas, CA
Booth: 1190

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Belden Corporation
Richmond, IN
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Beston Electronics Inc.
Olathe, KS
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Birdview Satellite Comm. Inc.
Chanute, KS
Booth: 206

Black Entertainment Television
Washington, DC
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Black Tie Network
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Blonder-Tonque Laboratories
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Booth: 514

Brad Cable Electronics Inc.
Schenectady, NY
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Broadband Engineering
Jupiter, FL
Booth: 975

Broadcasting Magazine
Washington, D.C.
Booth: 1285

Burnup & Sims Cable TV Prod. Gr.
Atlanta, GA
Booth: 640

Burroughs Corporation
Detroit, MI
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Business Systems, Inc.
Taylors, SC
Booth: 1480

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C & C Cable TV Enterprises Inc.
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C-2 Utility Contractors, Inc.
Eugene, OR
Booth: 602

C-COR Electronics, Inc.
State College, PA
Booth: 635

Cable Call Corp.
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Cable Communications Media Inc.
Bethlehem, PA
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Cable Credit Inc.
Richardson, TX
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Cable Safety Systems
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Cable Spinning Equipment
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Cable TV Supply Company
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CableAge
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CableBus Systems Corporation
Beaverton, OR
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CableData
Sacramento, CA
Booth: 505

Cablefacts
Lexington, KY
Booth: 985

Cableview Publications
New York, NY
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Cablewave Systems Inc.
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Cadco, Inc.
Garland, TX
Booth: 905B

Cambrian Compsult Ltd.
Sudbury Ont, Canada
Booth: 385, 386

Cardiff Publishing
Englewood, CO
Booth: 1025

Catel/Tomco Div. United Scient.
Santa Clara, CA
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CATV Services, Inc.
Fremont, CA
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CBA Inc.
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CBN Cable Network
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CCS Cable
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Century III Elect. Int'l. Inc.
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Channel Master, Div. Avnet Inc.
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Channelmatic, Inc.
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Booth: 766

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Booth: 900

Commco Construction Co.
El Campo, TX
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Communications Equity Assoc.
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Dallas, TX
Booth: 600

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Comsearch, Inc.
Reston, VA
Booth: 900I

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Harrisonburg, VA
Booth: 1075

Comtech Data Corporation
Scottsdale, AZ
Booth: 1085

Control Technology, Inc.
Garland, TX
Booth: 1180

Credit Protection Association
Dallas, TX
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Daniels & Associates, Inc.
Denver, CO
Booth: 840

Data Acquisition Services
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Delta Benco Cascade Limited
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Di-Tech Inc.
Deer Park, NY
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Diamond Communication Products
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Booth: 705

Digital Video Systems Corp.
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Disney Channel, The
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Ditch Witch
Perry, OK
Booth: 920

Dow Jones & Company, Inc.
Princeton, NJ
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Drop Shop Ltd., The
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Durnell Engineering, Inc.
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Eastern Microwave
Syracuse, NY
Booth: 1030

English Enterprises
Orlando, FL
Booth: 1070

ESPN
Bristol, CT
Booth: 440

Eternal Word Television Network
Birmingham, AL
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Financial News Network
New York, NY
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First Data Resources, Inc.
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Fishel Company, The
Columbus, OH
Booth: 1460

Fort Worth Tower Company
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Gamco Industries Inc.
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Booth: 1035

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Los Angeles, CA
Booth: 1330

General Cable Co-Apparatus Div.
Westminster, CO
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General Cable Co-CATV Div.
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General Electric Company
Portsmouth, VA
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General Instrument Co/Jerrold
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Gilbert Engineering Co.
Phoenix, AZ
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Gill Management Services, Inc.
San Jose, CA
Booth: 965

Group W Satellite Comm.
Stamford, CT
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Hamlin USA Inc.
Seattle, WA
Booth: 605

Harbor Fabricating Co.
Brea, CA
Booth: 540

Harris Corp. Broadcast Microwv.
San Carlos, CA
Booth: 1465

Hearst ABC Viacom
New York, NY
Booth: 730

Home Box Office
New York, NY
Booth: 1120

Home Theater Network
Portland, ME
Booth: 815

Hughes Aircraft Company-MCP
Torrance, CA
Booth: 620

Hughes Communications, Inc.
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IBM Corp.
Boca Raton, FL
Booth: 1355

Industrial Van & Truck Interiors
So El Monte, CA
Booth: 1096

Intercept Corporation
Clifton, NJ
Booth: 725

— J —

JFL (Just For Listening)
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Booth: 980

JVC Company of America
Elmwood Park, NJ
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— K —

Kanematsu-Gosho (USA) Inc.
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Klein &
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KMP Computer Systems, Inc.
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Costa Mesa, CA
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Lemco Tool Corp.
Cogan Station, PA
Booth: 601

Lindsay America
Buffalo, NY
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Linear Security Products Group
Inglewood, CA
Booth: 736

Lode Data Corporation
Denver, CO
Booth: 700

LRC Electronics
Horseheads, NY
Booth: 975

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M/A-COM Comm/Scope Marketing
Hickory, NC
Booth: 930

M/A-COM Linkabit Inc.
San Diego, CA
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M/A-COM MVS Inc.
Burlington, MA
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M/A-COM Prodelin
Claremont, NC
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Booth: 788
Motorola Semiconductor Product
Tempe, AZ
Booth: 1447
Mycro-Tek
Wichita, KS
Booth: 370

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Nationwide Cable Rep
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Booth: 1095
Northern CATV Sales Inc.
Syracuse, NY
Booth: 703

— O —

Oak Communications Inc.
Rancho Bernardo, CA
Booth: 520, 525
Octagon-Scientific, Inc.
Syracuse, NY
Booth: 905E
OEM Sales Corp.
Van Nuys, CA
Booth: 213
On Cable Magazine
Norwalk, CT
Booth: 1310

— P —

Pacific Telephone & Telegraph
San Francisco, CA
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Panasonic Industrial Company
Secaucus, NJ
Booth: 1455
Phasecom Corporation
Los Angeles, CA
Booth: 630
Pico Products Inc.
Liverpool, NY
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Pioneer Communications of Amer.
Columbus, OH
Booth: 450A
Pleasure Channel, The
Los Angeles, CA
Booth: 456
Poleline Corporation/Sub RMS
Bronx, NY
Booth: 612
Portac, Inc.
Santa Barbara, CA
Booth: 991
PortaVideo Entertainment Group
Phoenix, AZ
Booth: 1055
Precise Mfg. Co., Inc.
Tempe, AZ
Booth: 1000A
Premium Channels Pub. Co.
Bayshore, NY
Booth: 1065
Production Products Corp.
Manlius, NY
Booth: 455
Professional Education Network
Chicago, IL
Booth: 904F
PTL Inspirational Network
Charlotte, NC
Booth: 904
PTS Corporation
Bloomington, IN
Booth: 804
Pyramid Industries Inc.
Phoenix, AZ
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Quanta Corporation
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— R —

RAC Construction, Inc.
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Raustin Inc.
Manteca, CA
Booth: 205
RCA American Communications
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Booth: 825
Ripley Co. Inc.
Cromwell, CT
Booth: 216
RMS Electronics Inc.
Bronx, NY
Booth: 615
Rockwell International
Dallas, TX
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— S —

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Hailey, ID
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Booth: 1090
SATV Entertainment Corp.
Van Nuys, CA
Booth: 1290
Scientific-Atlanta, Inc.
Atlanta, GA
Booth: 510
SelecTV
Marina del Rey, Ca
Booth: 636, 637
Sharp Electronics Corp.
Paramus, NJ
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Showtime Entertainment
New York, NY
Booth: 1020
Siboney Communications Inc.
Irving, TX
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Signal Vision, Inc.
Laguna Hills, CA
Booth: 140
SIN Television Ntwrk & Galavis
New York, NY
Booth: 842
Sony Corp of America
Park Ridge, NJ
Booth: 1270
Sports Time Cable Network
St. Louis, MO
Booth: 850
Standard Communications Corp.
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Booth: 130
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Booth: 905A
Sun Software Inc.
Anaheim, CA
Booth: 904C
Supra Products, Inc.
Salem, OR
Booth: 801
Synchronous Communications Inc.
San Jose, CA
Booth: 1045

— T —

Taft Broadcasting Company
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Booth: 904A
TCS Cable
Houston, TX
Booth: 450, 451
Tele-Wire Supply Corp.
East Farmingdale, NY
Booth: 710
Telease Inc.
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Telecrafter Corp.
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TV Watch Incorporated
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— U —

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UNR-Rohn
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Salt Lake City, UT
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— V —

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Video Data Systems
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Winegard Company/CATV Division
Montgomeryville, PA
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World Video Library Inc.
Fort Worth, TX
Booth: 1370

— Z —

Zenith Radio Corporation
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Booth: 860

European flirtation with cable

U.S. enthusiasm should be tempered with caution

By Gary Arlen

The great European cable TV romance is underway. In Britain, France, Germany, Scandinavia and elsewhere, official commissions and optimistic entrepreneurs are accelerating their efforts to cash in on the cable bonanza. Inevitably, their eyes quickly turn toward North America, in an effort to take advantage of the continent's three decades of cable experience.

Intercontinental relationships already are taking shape. Programmers, notably HBO and Viacom, have formed joint ventures overseas to create and sell shows. Operators, including Cox and Rogers, are hot on the trail of European franchises, entering partnerships with domestic firms in those countries. And the equipment makers—from Scientific-Atlanta to Broadband Communications—are actively engaged with European counterparts to serve hardware needs in these untapped new markets.

Nonetheless, there's a nagging suspicion that the hopes and promises of this transatlantic cable TV romance will encounter the frustrations and problems of many other long-distance love affairs. Government officials and private businesses have repeatedly expressed an eagerness to move promptly on cable TV. At the same time, there was an underlying suggestion that, despite the best intentions, such a move will take far longer than anticipated.

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

Although conversations and contacts with U.S. cable TV companies are not necessarily a deliberate tease, it seems clear that European cable won't get down to serious business for a few more years. In the meantime, the would-be European cable operators and suppliers want to learn all they can from their North American predecessors. For their part, the Americans—nearly drooling at the chance to get into the European market, which is clearly underserved by the three or four TV channels available in most areas—are willing to go along with all sorts of proposals and ideas.

Many European executives admit they don't want to make the same cable TV mistakes that have stymied segments of the U.S. cable business. Notably in France, where an interministerial council is examining cable options, the current idea is to use the cable TV momentum to rewire the country. Today's idea (which may change tomorrow) is to install a fiberoptics system, built in a "star" architecture, to enable switching and other forms of enhanced services as part of the cable system. Curiously, one of the French plans now being bandied about involves only about nine channels of program service. The underlying hope is that cable TV construction will be part of an effort to upgrade France's domestic telecommunications capabilities.

Other Europeans also eye the arrival of cable as an opportunity to rearrange their communications facilities. In most countries, cable TV development is coordinated by an agency closely connected with the PTT or government-owned broadcast authority. Obviously, that leads to potential conflicts, as bureaucrats guard their turf. But it also opens up opportunities to expand the services now offered on government-run telephone or TV systems. Europeans are trying to determine if the cabling of their countries will give them the chance to introduce dramatically enhanced services, including switched video systems, data delivery facilities and other technologies that will leapfrog the current state of the cable TV art.

Such innovation is being encouraged. For example, French cable analysts are promoting longer franchises for proposals using fiberoptics. In part, that recognizes the longer amortization period needed for more expensive facilities. Another notion being considered calls for a 20-year authorization for cable TV operations.

Direct broadcasting satellite services also figure into European considerations. Government-run agencies recognize the need to offer services to citizens scattered through the less densely populated parts of their nation. In a country like Sweden, where one-fourth of the eight million population is concentrated in the Stockholm region and most of the rest live in a narrow southern strip of the country, distribution issues are immensely important. The government wants—and needs—to serve the sparse population pockets in the northern expanses. DBS offers promising options for delivery of entertainment, information and other services; but it will take time to analyze the prospects and see how they fit together. Swedish officials say they have established a group similar to England's Hunt Commission to write a report on cable TV/satellite issues. But, unlike the British task force that speedily issued its study, the Swedish commission plans to take two years to assemble its findings.

These factors explain why all this excitement about European cable will take so long to come to fruition. The studies, the planning, the deal-making, inevitably take longer than anyone would like. (U.S. cable TV experience should underscore that reality.) Another problem is European bureaucracy— certainly no better than its U.S. counterpart, and potentially more difficult because of the operating role of government-run telecom and broadcast systems. Moreover, many European nations are in the midst of their own telecommunications upheaval. After all, at the same time that hopeful European cable companies are looking at U.S. cable experience, their telecommunications colleagues are also eyeing the AT&T divestiture. In some countries, notably Britain, the government-run telephone monopoly is being split apart. Obviously, the U.S. scenario is being examined on that stage as well—including the relationship of cable TV and telephone companies.

Cable TV will inevitably come to Europe, and North American companies are sure to have a substantial role in its development. It's foolhardy to expect that European cable will be identical to U.S. services; the market and dynamics are simply too different and European administrators are intent on avoiding the mistakes the U.S. made.

One thing is certain, however: Europeans will escalate their examination of U.S. operations—including ever-increasing contingents at major industry trade shows, as indicated by the increased international contingent at last June's NCTA convention in Houston and the recent junkets to visit U.S. cable firms. December's Western Show should also attract numerous foreign visitors, with an eye on equipment and technology as well as on programming and operations expertise.

MCI plans new mail package

MCI Mail, the electronic messaging service recently unveiled by MCI Communications, will extend its gateway services to include ticketing and reservations, electronic banking, home shopping, electronic greeting cards and other information retrieval services. From start-up, MCI Mail has been hooked into Dow Jones News/Retrieval, which permits most N/R customers to begin using the electronic mail service immediately. MCI Mail customers will also be able to hook into DJN/R for standard fees, which opens up new marketing prospects for online information services.

In essence then, the aggressive new MCI project will become a form of videotex. MCI Mail will initially be available through any microcomputer (the company is already examining future enhancements). MCI also wants to establish electronic mail services for special interest groups and is even considering dedicated messaging operations for use within firms.

The MCI Mail service will allow personal computer users with modems to send and receive messages via a local or toll-free telephone call. Messages will be sent in 7,500-character blocks (three to five pages) for about $1 per block. If the recipient is registered with the MCI system,


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messages will go directly into an electronic mailbox. For non-customers, the messages will be sent to an MCI Mail Center, printed via laser printer and delivered by U.S. Mail, Purolator Courier or other messenger services (with extra fees for physical delivery).

MCI says it has spent $40 million to develop its electronic mail package. The first-year ad campaign alone will cost about $30 million. The company expects to carry about 20 million messages during the first year of operation and to do $1 billion annual business in electronic mail within a few years.

Beyond the immediate impact of messaging, MCI Mail could mark the first step in a new direction by carriers. Federal Express and other alternative carriers are preparing to offer electronic delivery systems. To add value to these systems, the operators will inevitably include gateways to information and transactional services—making the systems even more marketable to computer users. Such services could diminish the role that videotex system operators such as Times Mirror Videotex and Viewtron anticipate for themselves as direct distributors to end users.

The key advantage in a gateway is that it provides single point access to—and single statement billing for—a package of online or videotex systems, an attractive feature for users who want one-stop shopping for their online services.

In addition, electronic mail was one of the most popular features in all the recent videotex tests; hence, MCI Mail offers another attraction to potential videotex customers. Equally important, MCI has established marketing clout, with a base of national customers to whom the value-added gateway services can be sold immediately, certainly before videotex becomes available in most communities. (A dramatic side note: MCI's marketing budget for this new service is more than Viewtron has spent on developing its entire system.)

NAPLPS wins ANSI approval

At a mid-September meeting in Washington, D.C., the American National Standards Institute gave final approval to North American Presentation Level Protocol Syntax, which establishes precise guidelines for implementation of the videotex technical standard. The document will

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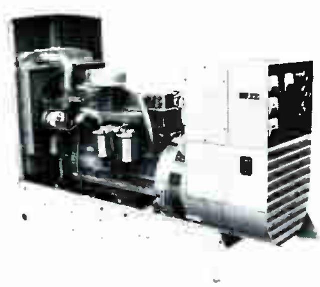

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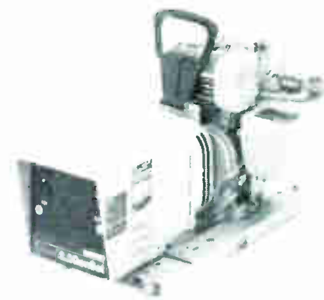

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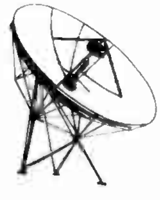

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■ **Dale Lister** has been named account representative for the Western sales region at the Jerrold Division of General Instrument Corp. Lister will be responsible for customer support and sales development. She formerly served as a sales group leader for Longmont Communications, Longmont, Colo. Another addition to the Jerrold sales force recently occurred when **George Fendrick** was appointed account executive. Fendrick will be responsible for accounts in Arkansas and Lousiana. His previous cable experience includes posts as a sales engineer at Oak Industries, sales manager for TOCOM Inc. and account executive for Gardiner Communications.

■ A new company, Cable Television Technology Inc. (C.T.T.I.), formed by the California-based Engineering Technology Inc., will be headed by **Ron Rogers**, who takes over as the new firm's president. **Steve Larson** will serve as the company's manager of operations. C.T.T.I. will provide various CATV services, including strand mapping, substructure engineering design and consulting.

■ **David Park** has assumed the post of director of marketing for CableBus Systems Corp. Park, who previously worked as a sales engineer in the Information Display Division of Tektronix Inc., will now oversee overall marketing and sales.

■ Harris Corp. has elected **John Hubner** corporate controller. Prior to this position, Hubner was controller for Harris' Information Systems Sector. **Roger Wach** has filled the position left vacant by Hubner's promotion. Similar to Hubner, Wach formerly worked for Harris' Information Systems as the vice president of finance for the information terminal group.

■ **Annette Jensen** has been named vice president, finance for Gardiner Communications. Since joining Gardiner in April 1981 as the company's corporate controller, Jensen has been instrumental in facilitating the firm's reorganization, a result of Burnup & Sims Inc.'s recent purchase, and is credited with having improved the company's internal operations.

■ United Satellite Communications has named **Claire Frankel** director, R.T.S. systems and supervisor, engineering change control. Frankel formerly served as title control system engineer at Stone & Webster Engineering Corp.

Ann Davis also has joined United Satellite Communications as director, special projects. Prior to joining United Satellite Communications, Davis was manager of consumer products planning analysis in corporate planning and development for the Sony Corp. of America.

■ **Roger Miller** has been appointed Western regional sales manager of Ampex Corp.'s Audio-Video Systems Division. Miller's tenure with Ampex began in 1959. Since then, he has held numerous sales and service positions and most recently covered a large sales area in the South Central region.

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Bravo	Daily	5 p.m./6 a.m.	None	**2**
FNN: Financial News Network	Weekdays	7 a.m./7 p.m.	975*/# 738*/#	**2**
KKGO-FM		24 hrs.	None	**17**
National Christian Network	Daily	24 hrs.	073*/#	**7**
The Playboy Channel	Daily	8 p.m./6 a.m	869*/#	**12**
SCAN		24 hrs.	None	**3**
SPN		24 hrs	429*/#	**3**
Trinity Broadcasting Network		24 hrs.	None	**17**
Westar IV				
SIN		24 hrs.	None	**3X**
Westar V				
ARTS	Daily	(E) 9 p.m./12 p.m.	None	**12D**

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

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Madison Square Garden	Daily	7 p.m./1 a.m.	None	**1D**
The Nashville Network	Daily	(E) 9 a.m./3 a.m.	674*/#	**9D**
Spotlight (West)		24 hrs	None	**11D**
WOR-TV		24 hours	None	**2D**
Comstar D-4				
Country Music Television		24 hours	None	**9H**
Galaxy 1				
SIN		24 hrs.	819*/#	**6**
GalaVision	Weekdays Weekends	4 p.m./4 a.m. 24 hrs.	None	**20**

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

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