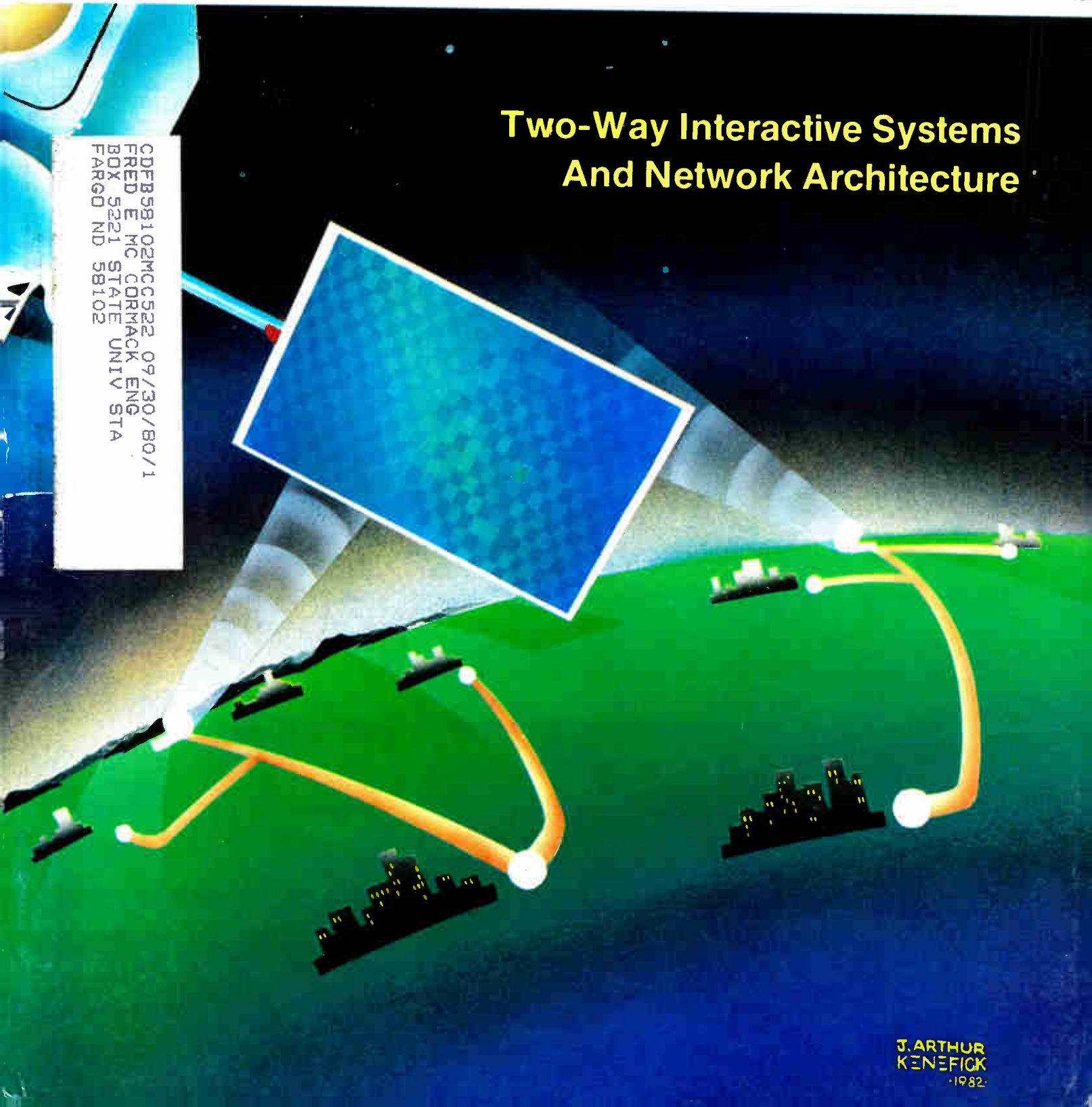
CED™

Product Profile: Video/Audio Modulators

Communications Engineering Digest/The Magazine of Broadband Technology April 1982

Two-Way Interactive Systems And Network Architecture



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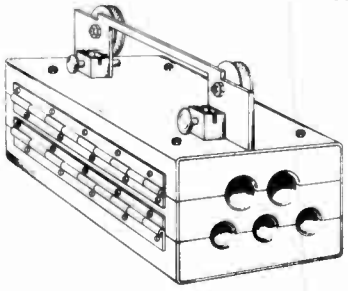

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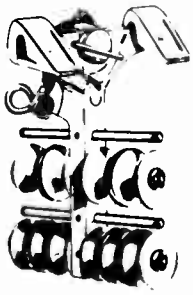

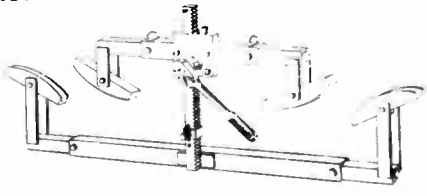

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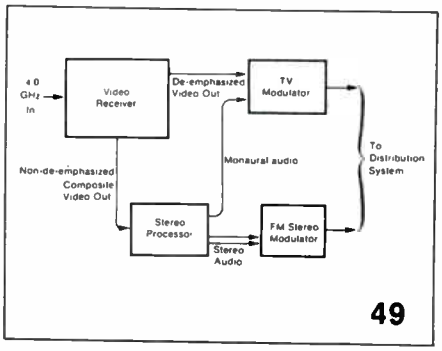

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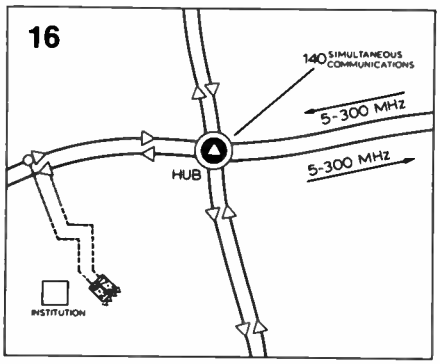

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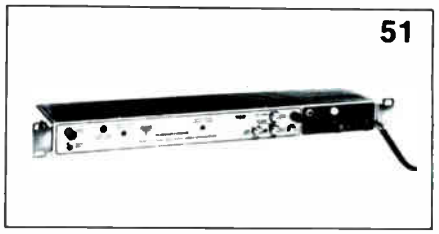

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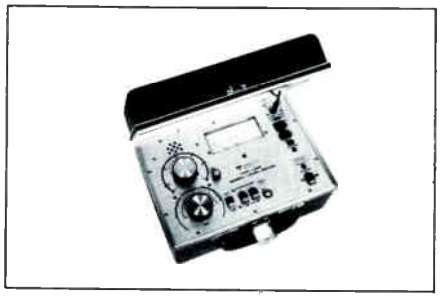

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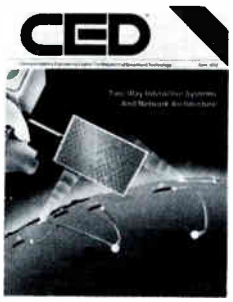
About the Cover:

The extensive use of two-way interactive operations implies national and regional networking capabilities. This month's **CED** cover depicts the satellite interconnection of regional centers that provide linkage for local loop systems.



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Techscope

Warner Beats Pittsburgh Deadline

In an unprecedented urban cable construction effort, Warner Amex Cable of Pittsburgh beat its first construction deadline by more than thirty days, Warner has announced.

The contract with the City of Pittsburgh required Warner to have 25 percent (204.3 miles) of the cable system installed and marketed by February 25, but Warner was able to have 224.3 miles in by the end of January.

Warner Vice President and General Manager Edward H. Campbell praised the people and officials of Pittsburgh for their cooperation with Warner's efforts to install the large, urban system.

Westar IV: Smooth Bird

Westar IV was successfully launched at 7:01 p.m. (EST) February 25, only 11 minutes behind the scheduled launch time of 6:50 p.m.

"It was a beautiful sight," said Mike Caffarel, senior product manager with Western Union. "There were no problems. It was a textbook launch."

Following take-off, the satellite went into its transfer orbit and, at 1:22 p.m., within a half a second of nominal time, the apogee motor fired and kicked the satellite into a geostationary orbit.

In preparation for its ultimate union with Westar I, Westar IV will spend approximately two weeks at 79° West Longitude and will then move into co-orbit with Westar I at its permanent location of 99° West Longitude. Complete transponder transfer from Westar I to Westar IV is expected in mid-April, when Westar I will be moved out of use to a 79° West Longitude orbit.

Westar V Earlier Bird

Due to an earlier availability for a NASA launch, Western Union Corporation has announced that its fifth domestic communications satellite, Westar V, will be sent up on June 8. Western Union has been seeking an earlier launch date to meet the growing need for satellite communications and had previously announced an October date, only to move it up to September. If this pattern continues, the communications industry may be able to expect that Westar V will have been launched a day before lift-off. Stand by for further announcements.

CBS HDTV In SF

High Definition Television (HDTV) propagation measurement tests are about to begin in San Francisco. CBS is preparing to transmit in the 12 GHz band beginning on April 15 and will continue testing throughout the spring months. The transmissions will be over-the-air and will involve only terrestrial facilities. Using a transmitter borrowed from the French network, TDF, and positioned on Mt. Sutro, the Bay Area transmissions will be monitored from mobile vans located around the city. The test of HDTV signals follows on the heels of promotional demonstrations around the country in January and February put on by CBS and NHK, the Japan Broadcasting Corporation. High Definition Television involves 1,125 scan lines, an aspect ratio of five to three, and requires, at the present state-of-the-art, 30 MHz bandwidth, although final determination of standards has not been set.

VBI Teletext Service Announced

Field Electronic Publishing Inc. and Satellite Syndicated Systems Inc. are discussing a joint venture to provide a national teletext service over a vertical blanking interval of transponder six, Satcom III. Employing a teletext magazine format, the service will offer a package of up-to-the-minute news, sports, business, weather and leisure information and will require a subscriber decoder box that will be bought and owned by the subscriber. Word has it that Zenith will manufacture the decoders. The proposed national teletext magazine will be demonstrated via satellite at the NCTA Annual Convention in Las Vegas in May and it is proposed to be in full operation prior to the Western Cable Television Show in November.

Warner Amex Techs

Unlike many graduates these days, the 19 students completing their course this month at the Cincinnati Opportunities Industrialization Center won't have any trouble finding work. They comprise the first class of QUBE cable installers, locally recruited and trained by COIC and Warner Amex Cable Communications of Cincinnati. Participants completed a three-month course in preparation for employment with the Cincinnati system.

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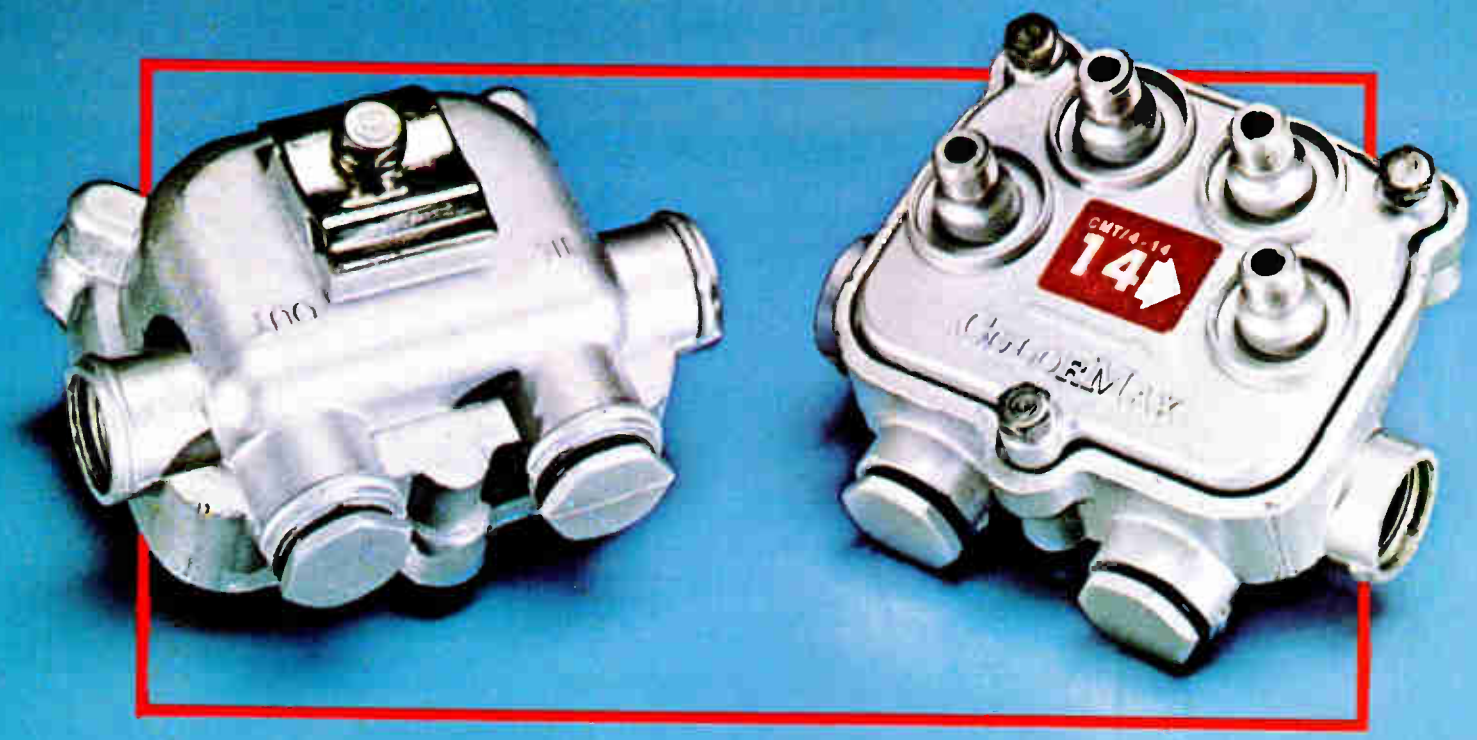

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Seminars

April

8-10: The **Michigan Cable Television Association** annual winter meeting will be held at the Grand Plaza Hotel in Grand Rapids. Contact Sandra Applegate, (313) 235-6112.
8-19: BMM National Schools is conducting a two week C.A.T.V. technical seminar at the Van Nuys, California, facility. For reservations call: (213) 994-2288.
12-25: BMM National Schools is conducting a two week C.A.T.V. technical seminar at the Dallas, Texas, facility. For reservations call: (213) 994-2288.
14: First Annual Delaware Valley Chapter SCTE Convention, Fiesta Motor Inn, Ext. 27 PA Turnpike, Willow Grove, PA. Contact John Kurpinski, (800) 345-8286.
14-16: Magnavox CATV Systems will be conducting a field training seminar in its Mobile Training Center at the Hilton Hotel in Englewood, Colo. Contact Larry Richards, (315) 682-9105.
19-20: The **New York State Cable Television Association** and the **New York State Commission on Cable Television** are sponsoring a management conference at the Albany Hilton Hotel. Contact the cable association, (518) 463-6676.
19-24: Two back-to-back, three-day field training seminars sponsored by **Magnavox CATV Systems** will be conducted in its Mobile Training Center at the Hilton Hotel in Englewood, Colo. Contact Larry Richards, (315) 682-9105.
30-May 2: "MDS. . . for the 80s and Beyond" is the topic of a seminar sponsored by **Dorason Corporation** at the Aladdin Hotel in Las Vegas, Nev. Contact Joanna Cherry, (415) 348-8360.

May

3-5: The **National Cable Television Association**'s 31st annual convention will be held at Las Vegas Convention Center, Las Vegas, Nevada. Contact Dan Dobson, (202) 775-3550.
3-7: A **Community Antenna Television Association** advanced technical training seminar will be held in Albany, New York. Contact the CATA Engineering Office, (305) 562-7847.
12-14: Magnavox CATV Systems will be conducting a field training seminar in its Mobile Training Center in Detroit. Contact Kay Hinkle, (315) 682-9105.
17-19: Magnavox CATV Systems will be holding a field training seminar in its Mobile Training Center in Detroit. Contact Kay Hinkle, (315) 682-9105.

Looking ahead

March 11-16: National Association of Television Program Executives convention, Las Vegas Hilton, Las Vegas, Nevada.
April 4-7: National Association of Broadcasters convention, Dallas, Texas.
May 2-5: National Cable Television Association convention, Las Vegas, Nevada.
June 2-4: Canadian Cable convention, Sheraton Centre Hotel, Toronto, Ontario, Canada.
June 6-9: Great Lakes Exposition, Indiannapolis, Indiana.
July 18-23: Cable Television Administration and Marketing Society annual meeting, Hyatt Regency, Chicago.
September 9-11: Eastern Show, Georgia World Congress Center, Atlanta.
October 26-28: Atlantic Cable Show, Bally Park Place, Del Webb's Claridge and Brighton Hotels, Atlantic City, New Jersey.

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Editorial

Scrambling The Piracy Issue

Everyone in this industry knows that signal piracy is an important and growing problem but few know the magnitude. Even though the cost for a private earth station system ranges from $3,500 to $15,000, private earth stations owned by individuals for the reception of signals without a monthly charge are growing in popularity. According to the Society of Private and Commercial Earth Stations (SPACE), earth stations are being purchased at an estimated rate of between 10,000 and 15,000 per month, not including those purchased by cable systems and broadcast stations. National Microtech has sold more than $22 million worth of its new Apollo ZX home antenna systems since the product was introduced less than two months ago.

While it may be true that many of the private earth stations are bought by homeowners in geographically remote areas that can't be reached by cable, programmers and their affiliates still have a right to make a buck from their very expensive efforts. Something must be done to protect the programmer's product from illegal interception.

The Communications Act of 1934, specifically Section 605, prohibits unauthorized interception of telecommunications signals and currently in Congress, H.R. 4727, a bill introduced by Rep. Waxman (D-CA), would provide specific civil and criminal penalties to the existing statutory provision, especially for the unauthorized interception and use of subscription or pay-TV signals.

Of course, along with the welcome strengthening of legal remedies offered by the Waxman bill, the programmers have been seeking cost/effective methods of scrambling their signals without the as yet unresolved problem of significant picture quality degradation. At this point, the cost of scrambling is high so both sides of the cost/effective equation are undesirable.

Equally undesirable were the politics of scrambling that recently surfaced. HBO announced that it was planning to scramble its signal. The announcement was ill-timed, poorly managed and precipitated an equally unfortunate and not altogether altruistic reaction from a competitor, WASEC.

Here's how the events occurred. An executive at Time, Inc., HBO's parent company, gave an otherwise innocuous interview to a reporter for the *Wall Street Journal* in which he mentioned that HBO is planning to scramble its signal next year. The reporter picked this up and ran a story February 16 which exaggerated the scrambling angle. Then, at the Texas Cable Show, HBO executives further publicized its scrambling decision which led to further press coverage. In reaction, officials at WASEC, producers of The Movie Channel, raised a cry in an attempt to discredit HBO and claimed that the scrambling announcement undercut industry-wide efforts to promote the Waxman bill.

It's more likely that HBO was perceived by WASEC as attempting to get the jump on its competitors in the contest for affiliates. Since everyone assumes that signal scrambling will eventually be used, it seems unlikely that HBO's announcement will have any effect on the progress of the Waxman bill. Nevertheless, it seems poor judgement on HBO's part to have sought so much publicity on this question in the context of a push for tough legislation. Showtime officials have kept a lower profile during this round of the fighting. Showtime's announcement last year that it will eventually scramble its signal hardly caused a ripple.

It is generally believed that our industry is in its infancy, even though some of our members occasionally act like adolescents.

George Sell

CORRECTION: The March **CED** misidentified Andrew J. Healey as the chief technician of the Rockland Cablesystem. He is, in fact, the regional engineer for American Cablesystems Corporation based in Peekskill, New York. **CED** regrets this error.

CED

Volume 8, No. 4

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Harris Corporation Has New 3M Antenna

MELBOURNE, FLORIDA—Harris Corporation, Satellite Communications Division will soon be announcing a new three meter antenna system. **CED** has learned that the system, which will be called the Delta Gain System, will offer 10 to 15 percent higher efficiency and a lower noise temperature than any antenna presently in use at this aperture size.

The Delta Gain antenna is a new design and the total system package includes an electronic polarization control, low noise amplifier, and a new video system featuring a newly designed video receiver. Further details will be released prior to the NCTA Annual Convention in Las Vegas.

One-Way Addressable Application

COLUMBUS, OHIO—Pioneer Communications of America has a new one-way addressable system. "We have applied the addressable technology which Pioneer has been supplying for the past four years in our VIP two-way addressable converters to a one-way addressable design," said Bob Matsumoto, Pioneer president.

The Pioneer VIP one-way addressable system provides for single or dual cable operation with 58 selectable channels available on single cable, and 109 channels on dual cable. Forty-two of the channels are controllable on single cable, and 84 on dual cable, providing for pre-ordered pay-per-event, non-pay discipline, headend tier control, narrowcasting and tier reconfiguration.

Designed for systems from 50 to 401 MHz, the VIP one-way addressable features standard, HRC and IRC channel alignments. It is designed to poll 15,000 terminals at a maximum interval of five minutes. A wireless remote unit will be available. A special feature is parental control capability.

Matsumoto said the complete system will be unveiled at the 1982 NCTA convention in May.

Tektronix Introduces FOTDR

BEAVERTON, OREGON—A new fiber optic time domain reflectometer (FOTDR) combining an exact loss and distance calibration ability with monolithic, sturdy and portable features has been introduced by Tektronix.

The Tektronix OF150 FOTDR is well suited to the maintenance and installation of fiber optic links in communications corridors because of its advanced ability to measure the amount of signal commonly lost through the spliced sections of a communications link.

Typically, fusion and connectorized splices lead to signal loss ranging from 0.3dB to 1.0dB. FOTDRs measure the loss and, if it is too high, the splice can be redone. The OF150 offers an advantage over previous FOTDRs in that installers can "see through" a greater distance from one end of the fiber output cable, saving time and effort by limiting the number of set-ups and moves.

The OF150 calculates signal loss by sending a radiant energy pulse through the fiber section being tested. Any energy lost as the pulse travels through is reflected, calculated and displayed by the OF150. Such testing is done routinely during the process of accepting, installing and maintaining the cable. The instrument also has a chart recorder and an LCD readout.

Currently, the OF150 is only available in the United States and Canada, but Tektronix plans to market it world-wide by June of 1982.

C-COR To Supply Equipment To Argentina

STATE COLLEGE, PENNSYLVANIA—C-COR Electronics, Inc., has been chosen to supply distribution electronics to Video Cable Comunicacion S.A., of Argentina, for use in construction of a cable television system which will exceed 1,000 miles in the city of Buenos Aires, and will be able to reach 10 million people.

C-COR's Systems Engineering Department will supply the design for the project. Delivery of equipment will begin in spring of 1982. As part of the overall program C-COR has trained Video Cable Comunicacion personnel in preparation for their construction program.

South American Cable

LOS ANGELES, CALIFORNIA—Intercable Inc. has entered into an agreement with the Ibarbia family, a group licensed by the Argentine government to construct and operate a cable television system for the city of Buenos Aires. Intercable Inc., a Los Angeles-based firm, will work as a consultant in the design and construction of the system with the support of RCA Cablevision Systems of Van Nuys, California, and the Windsor Pacific Corporation. Intercable Inc. and RCA cooperated in the development of the Costa Rican system and will be active in establishing several new proposed systems in South America and other locations worldwide.

Videotex Group Petitions FCC

WASHINGTON, DC—The Videotex Industry Association of America is pushing for a speedy resolution from the Federal Communications Commission on the issue of teletext transmission. In reply to the recent rulemaking commentary received at the FCC, the VIA reaffirmed its position that broadcasting content regulations should not apply to teletext.

While not taking a position on the adoption of a single technical standard, the VIA proposed that stations be free to provide teletext without FCC authorization.

Other proposals seek station authority to operate on a subscription or advertiser-supported basis without approval or notification; to sell or lease decoders; to offer teletext as an addressable service to be used for electronic mail; contract with information providers to prepare content and market services; to charge subscribers and information providers fees not based on common carrier rate or access obligations.

In stressing its belief that broadcast content regulations shouldn't apply to teletext, the VIA noted that some statutory content rules should be considered.

Business Notes

★ **California Microwave, Inc.** has announced receipt of a $1.1 million contract from Communications Satellite Corporation (COMSAT) for ground communications equipment to be provided by the company's subsidiary, Satellite Transmission Systems, Inc. (STS). STS will provide 61 Intelsat satellite receivers and associated automatic control interface equipment to be installed in the COMSAT earth stations at Etam, West Virginia; Brewster, Washington; and Andover, Maine. The voice communications satellite receivers are from a new line of ground communications equipment recently introduced by STS.

★ **Oak Industries Inc.** today reported record operating results for 1981, with a 51 percent increase in net income on a 32 percent gain in sales. Oak claims it ended 1981 with a backlog of $224.5 million,

highest in its history. Sales in 1981 were $507,119,000 compared to sales of $385,586,000 in 1980. Net income for the year amounted to $30,350,000. In 1980, net income was $20,082,000. Earnings per share in 1981 were $2.23 on 13.6 million average common shares outstanding. For the previous year, earnings per share were $1.85 on 10.8 million average common shares outstanding.

★ A $270,000 order has been placed with **C-COR Electronics, Inc.**, by **GE Cablevision** of Grand Rapids, Michigan, for specially designed mid-split amplifiers for Grand Rapids' cable traffic control system. Under the deal, C-COR will provide Grand Rapids with the amplifiers for the B-Trunk of its dual-trunk system. The system calls for a 150-300 MHz forward bandwidth with a reverse bandwidth of 5-88 MHz. To meet Grand Rapids' needs, C-COR will modify its standard mid-split amplifier for traffic control use.

★ **Scientific-Atlanta Inc.**, has received an order for its high-speed broadband data modems from **Manhattan Cable** for use in that company's business communications network. The Model 6402 T-1 modems will provide high-speed communications capability for a number of commercial businesses for which Manhattan Cable provides communications services. Scientific-Atlanta has also received a $2.5 million order from **Southern Cable Systems** of Waycross, Georgia for equipment for 41 complete cable television systems to be built in Georgia and Alabama. For each of the 41 systems, Scientific-Atlanta will provide a five-meter satellite earth station, a two-bay headend, receivers, distributiuon equipment, taps, passives and coaxial cable. Delivery is scheduled over a 24-month period beginning in February 1982.

★ **Cablevision of Connecticut** has selected **S.A.L. Cable Communications Inc.** to supply CATV equipment valued in excess of $2.5 million for the construction of Cablevision's new system in Fairfield County, Connecticut. The purchase agreement between Cablevision and S.A.L. covers three years, and involves electronic components, hardware and tools. The new system will wind through 1,800 miles of Southwestern Connecticut, including the cities of Greenwich, Norwalk and Stamford. Construction of the system began in January, and S.A.L. is delivering the equipment to Cablevision's Fairfield County construction center in Norwalk.

★ **C-COR Electronics Inc.**, has announced that **Times Mirror** of Irvine, California, has placed equipment orders for three of their cable systems in the East. The systems, located in Beaver Falls, Pennsylvania; Toronto, Ohio; and Weirton, West Virginia, will begin taking shipments of trunk amplifiers, extender amplifiers, main line passives and accessories immediately. The system extension in Toronto will be using 270 MHz bandwidth equipment as will the Weirton system. The Beaver Falls system extension will install 400 MHz equipment.

★ **BMM National** announces the opening of their Dallas, Texas facility, the second of ten planned schools. The first technical course will commence on April 12 with a planned two-week (80 hour) training program every other month. In addition, there will be a one-week (40 hour) installation course twice a month. Representatives from CATV manufacturers and other product lines will assist in making this the finest training facility of its kind.

★ **Bay Cable TV Associates** of Marion, Massachusetts, has signed a $1.8 million, 12-month purchase agreement for addressable converters with the Jerrold Subscriber Systems Division of **General Instrument Corporation**, a Jerrold spokesman said today. All of the converters will be 58-channel digital remote-controlled 400 MHz Jerrold STARCOM

units furnished with Jerrold STARBASE Add-On Addressable Descramblers. Roughly two-thirds of the units will be used in a new Bay Cable system in Weymouth, near Boston.

★ **Anixter-Pruzan** and **3M's** Dynatel department have announced an agreement giving Anixter exclusive distribution of Dynatel cable and fault locators for the CATV industry.

★ **Pioneer Communications of America Inc.**, has received a commitment from **Perry Cable Television Corporation** for purchase of 35,000 BC-2002 cable television converters during 1982. The BC-2002 is one of Pioneer's line of 36-channel, tunable converters designed to fit compatibly in systems to 440 MHz.

★ **PTL Television Network** is expanding its studio in Charlotte, North Carolina, with RCA equipment valued at approximately $3 million. The equipment on order from RCA here includes five TK-47 triaxial cameras, two TKP-46 portable studio cameras, three TR-800 one-inch video tape recorders, a graphics generator, and two Grass Valley production switchers, a 1600-7K and a 300-3AN.

★ **Microdyne Corporation** has announced the development of a new manufacturing technique for its parabolic antennas. The technique was developed by Microdyne's antenna subsidiary, Antennas for Communications, and features cost saving techniques that will eventually be passed along to commercial consumers. The process is a vacuum assisted, resin-injected technique. This method of manufacture results in a substantial reduction in labor costs. AFC's accomplishment was acknowledged at the 37th annual conference of the SPI Reinforced Plastics/Composite Institute by the award of first place in the electrical/electronics division. According to Microdyne spokesman Alan Greenlaw, the curing time for finished antennas is now about two hours but the company is trying to bring that time closer to one hour.

★ **Biro Engineering** has developed a computer program, the CATV industry's first, according to the company, which produces customized, computer calculated and computer drafted CATV antenna-tower, antenna-array designs. The program contains the parameters of all the TV stations in the United States, Mexico and Canada and works with any type of antenna/antenna-array configuration installed on guyed or self-supporting towers. According to the company, the computer calculated array dimensions are exact, providing maximum protection against co-channel, adjacent channel and second harmonic FM transmitter interference. A three-dimensional computer drafted picture is also available as an option.

★ **Scientific-Atlanta Inc.** has received a $3.3 million order for 54-channel set-top terminals from Matrix Enterprises Inc. of Franklin, Tennessee. The order is in addition to Matrix Enterprises recent $2.5 million order for Scientific-Atlanta CATV headend, earth station and distribution equipment and coaxial cable, bringing the total order to $5.8 million. Equipment from both orders will be used in building a new cable system in Blount County, Tennessee, owned by Countywide Cable TV Inc., Alcoa, Tennessee, a subsidiary of Matrix Enterprises.

★ **Comtec Inc.**, which provides cable television service to 40,000 subscribers in the Hilo, Hawaii area, has ordered 5,000 Model KS 58-channel digital set-top converters from RCA Cablevision Systems for use by the cable system's customers. The RCA KS Series converters feature a microcomputer design that incorporates frequency-synthesized tuning with AFC for automatic channel tuning. The converters, available in set-top or infra-red cordless remote control models, use a 16-position pushbutton key pad with LED display.

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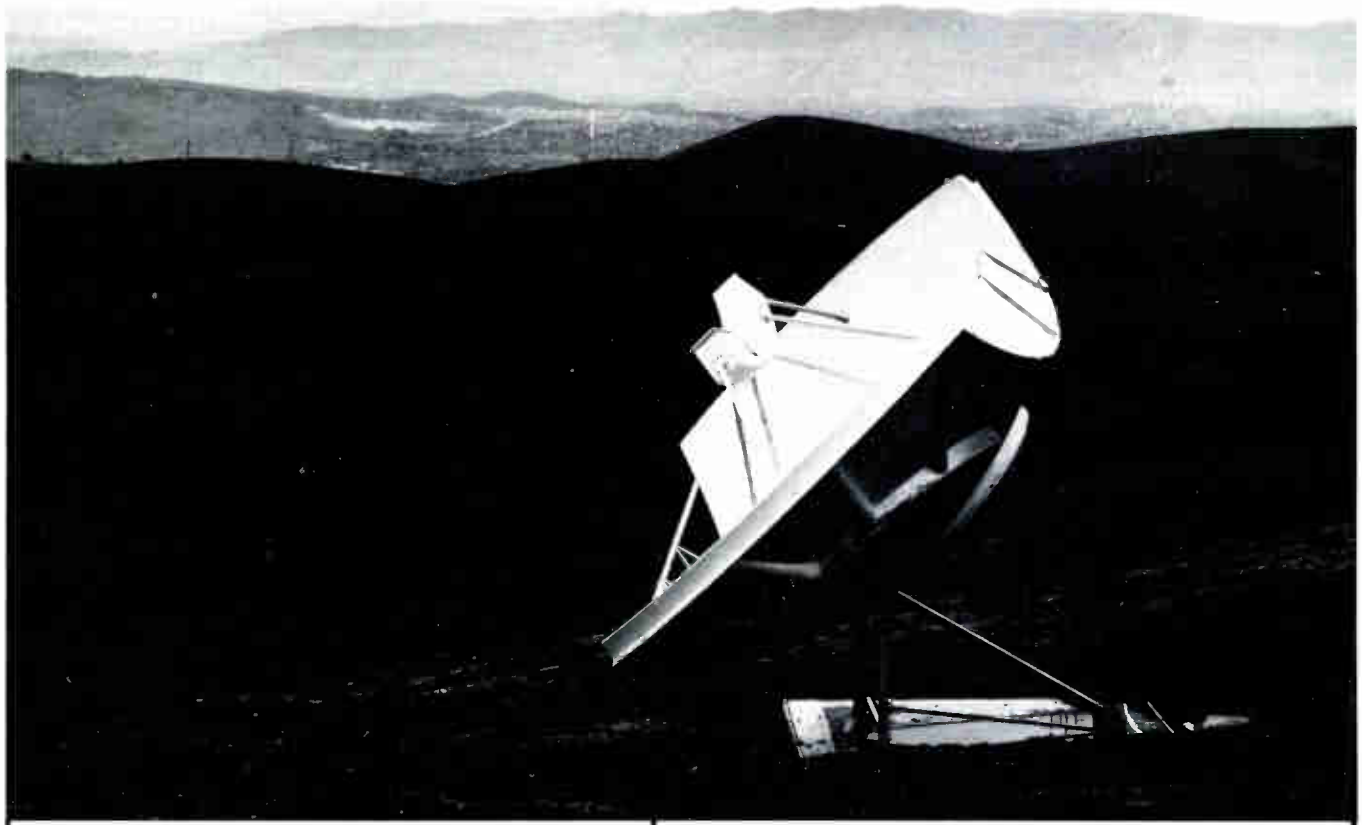

Only SIMULSAT® can see all domestic satellites at once with consistent performance on each satellite. In other words, with Simulsat you can see from Satcom III-R (131°w) to Satcom IV (83°w) with the performance characteristics of a 4.8 meter antenna.

The benefits of Simulsat to a cable company or broadcast station are numerous. Consider the time and money saved with one Simulsat installation, compared with adding another dish every year and building an antenna farm. Installation crews, cranes and permits require valuable time and energy.

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Simulsat represents a new generation of antennas. If your company seeks the best that today's technology has to offer, then let Simulsat be your plan for the future.

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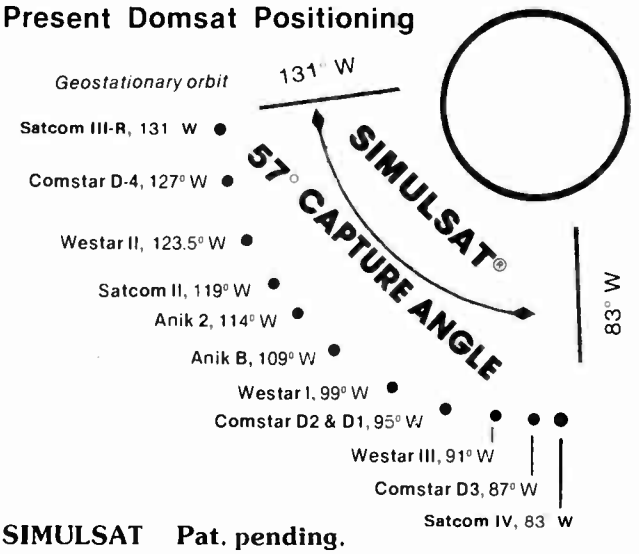

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Structuring Two-Way Cable TV Technologies

By Ernest O. Tunmann, president, Tele-Engineering Corporation

This article covers the broad range of uses of state-of-the-art coaxial cable transmission systems for integrated video, voice and data transmission. It describes the four levels of a nationwide broadband coaxial transmission system that would permit the transfer of high speed data, voice and video. The Regional Interconnect System Architecture (Level 3)—"the missing link"—is discussed in detail relative to frequency spectrum, capacity and equipment requirements.

It is my firm belief that the business transmission system of the future must combine high speed data, voice and video. Anything short of such a network will ultimately fail.

It is my firm belief that both cable operators and communication managers throughout the business community must learn the basics of broadband communications, PCM multiplexers and broadband switching.

What we have before us is a merger of computer technology with broadband transmission and switching technology.

It is also my belief that the cable operator of the future must become familiar with common carrier regulations and set up common carrier subsidiaries for business communications, or be bypassed by more aggressive entrepreneurial organizations.

We will take you through the nuts and bolts of broadband communications and will

- describe the regional interconnect system architecture
- analyze the spectrum efficiency of the regional interconnect cable
- describe the regional communications center of the future
- leave you with some thoughts, milestones and recommendations on how to get from here to there.

Figure 1

Level	Broadband voice/data/video	Transmission Medium	Operator
1	- In-plant - Intra Business - Local Area Network	- MW - Video Cable - RF Cable	Business and Industry
2	- Inter Business - Intra Town	- RF Cable	Cable Company
3	- Inter Town - Intra Region - Long Distance	- RF Cable - MW - Fiber	unknown Specialized Common Carrier
4	- Inter Region	- Satellite	SBS AT&T MCI WU SPC

Figure 2

Ethernet	Xerox
Arc	Datapoint
Primenet	Prime Computer
Mailway	Wang Laboratories
Wise	Wang Laboratories
Mitrenet	Mitre Corporation

Local Area Communication Networks

Hierarchy of nationwide systems

Figure 1 describes the various levels of broadband communications.

There are four levels:

Level 1: The in-plant broadband network, also called the local area communications network or the office of the future. It provides high speed data, voice and video communications throughout a building or a group of buildings. Traffic to the outside world, or interplant communication, cannot always be established by business-owned earth stations and, therefore, a broadband cable connection.

Level 2: The broadband cable connection is the Cable TV Distribution System and the Institutional Cable that will develop into the Industrial Cable. Transmission of voice, data and video will arrive at the Hub of the local cable company. Distribution of locations within the franchise area will be performed by the cable company. Regional and long distance traffic will be grouped and switched to Level 3, the Regional Interconnect System.

Level 3: The Regional Interconnect System, or "the missing link", collects broadband transmissions from a group of local cable companies and forwards the traffic to the Regional Communications Center. The RCC will be the switching center for regional and long distance transmissions. Regional transmissions will go to other cable company hubs. Long distance transmissions will be forwarded

to the operating satellite communications carrier of your choice.

Level 4: The satellite communications carrier will complete the nationwide long distance connections and route all broadband communications to the appropriate Regional Communication Center.

As you know, Level 4 is well established and is waiting for you to close the gap of Levels 2 and 3. The level revolution is just getting started to interlink in-house computers and rebuild the internal telephone system using digitized voice.

Large industries will not wait for you to make up your mind on Levels 2 and 3. They will establish their own communication center and go directly from Level 1 to 4 (MACOMNET). Medium size and small businesses with the need for regional and long distance high speed data will be the best target.

Level 1 networks

There is an ongoing parallel development to Cable TV Distribution systems in the business community. Intra- and Inter-Plant Communication Systems are going broadband.

Some examples of these services are shown in Figure 2.

These systems are mostly baseband systems and handle speeds from 9.6 Kbps and 56 Kbps to 10 Mbps. In all cases and related developments, the goal is to develop an integrated voice/data communication system that can deliver 56 Kbps data and digitized voice to every office desk, and to permit high speed communication between terminals and computers integrated with digitized voice PABX systems.

Tele-Engineering Corporation just completed a dual mid-split facility at Brown University in Rhode Island. The system will be used for video, camera surveillance, security, energy management and data transmission (see figure 3).

To satisfy the University Campus' needs for multi-terminal to multi-computer interconnection, a SYTEK Local Net System 20 has been chosen. Any terminal can communicate with any computer connected to the system at 9.6 Kbps data rates. The system uses a Carrier Sense

Figure 3

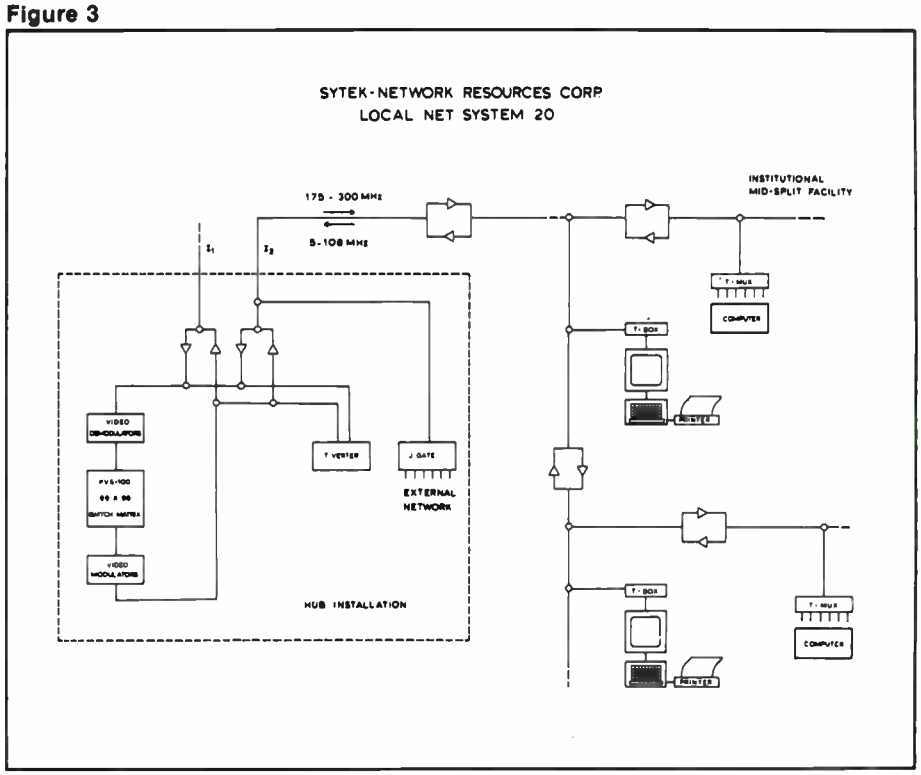
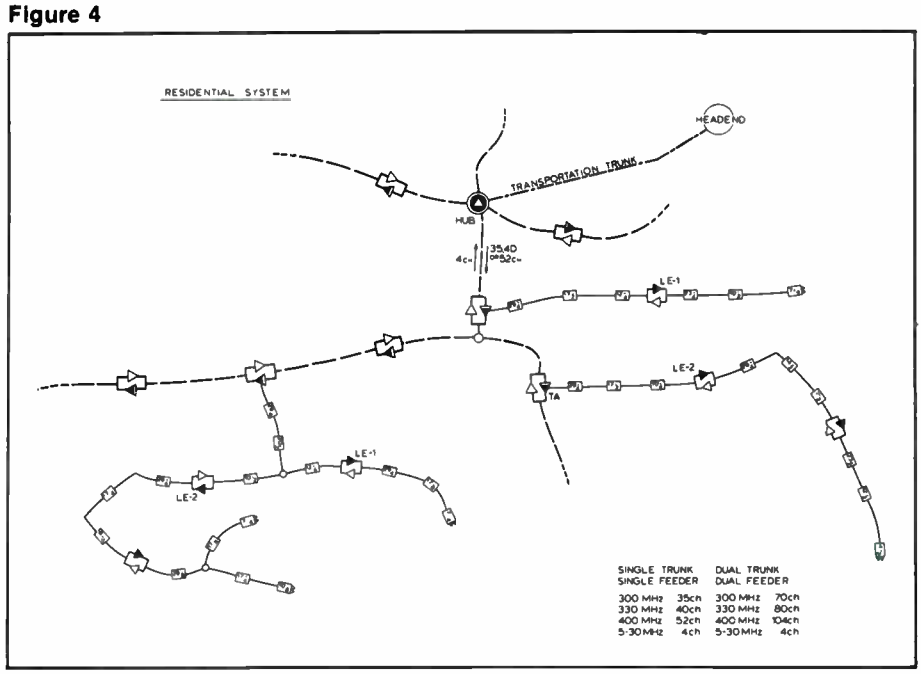
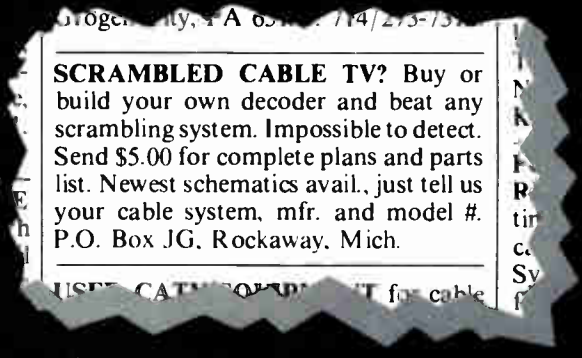


Figure 4

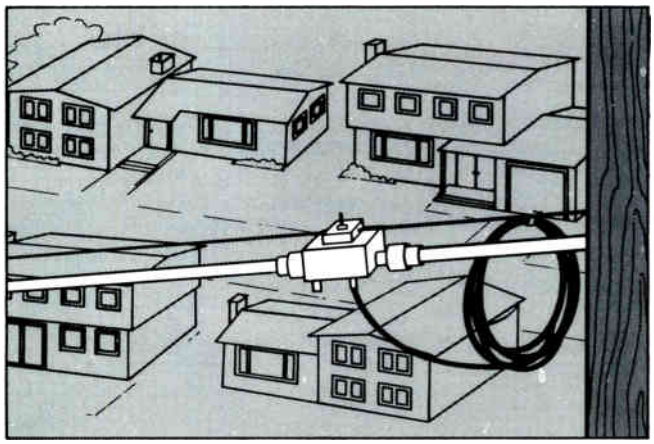


HOW TO STEAL THE SHOW.



SCRAMBLED CABLE TV? Buy or build your own decoder and beat any scrambling system. Impossible to detect. Send $5.00 for complete plans and parts list. Newest schematics avail., just tell us your cable system, mfr. and model #. P.O. Box JG, Rockaway, Mich.

HOW TO STOP IT.



Vitek multi-channel traps provide more security for your premium channels.

No matter how sophisticated a scrambled Pay-TV security system is, as long as the service goes into a home, it's vulnerable. For once it's inside the home, subscribers can clip wires, un-do security screws, buy "black boxes" and come up with ways you haven't even dreamed of to take your Pay-TV service for a ride.

Industrywide, theft of service translates into an operator's nightmare of up to $140 million annually*. And as cable systems increase their Pay-TV services by adding 2, 3, 4 and more premium channels, the temptation to cheat will increase just as dramatically.

Trapping outperforms scrambling.

That's why major MSO's and independent cable systems alike are turning to Vitek traps to protect their programming and their revenues. They already know how trapping outperforms scrambling schemes in effectiveness and in reducing costs.

Traps are more effective because they can block out up to 4 separate channels or other combinations of tiers, *before* they enter the home. That eliminates the chance of cheating by subs who don't pay for the service. And, best of all, trapping means zero degradation for your pay subscribers, compared with reconstituted decoding techniques.

With today's multi-TV set homes, traps are more economical because they eliminate the need to install one or more descramblers inside every home in your system. That means substantially lower overall costs, whether you are adding new pay service, bidding on new franchises, or rebuilding your existing system. And only Vitek traps have a patented construction that makes them virtually maintenance free.

Vitek is the most effective trap.

When it comes to Pay-TV security, the most effective method you can use is trapping. And the most effective trap is Vitek. That's why over a thousand cable systems are already using Vitek single and multi-channel cable traps to protect their revenues.

Make sure you maintain the profit in your pictures by calling Vitek today at (201) 287-3200—before anyone else tries to steal your show!

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I am concerned about my Pay-TV revenues! I am interested in:

- ☐ Upgrading System
- ☐ Rebuilding System
- ☐ New Franchise Proposal

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Title Telephone

Cable System

Address

City State Zip CED 4/82

**Based on a Kagan report of monthly revenues in The Pay-TV Newsletter, April 30, 1981, and conservative estimates of a 10% piracy rate.*

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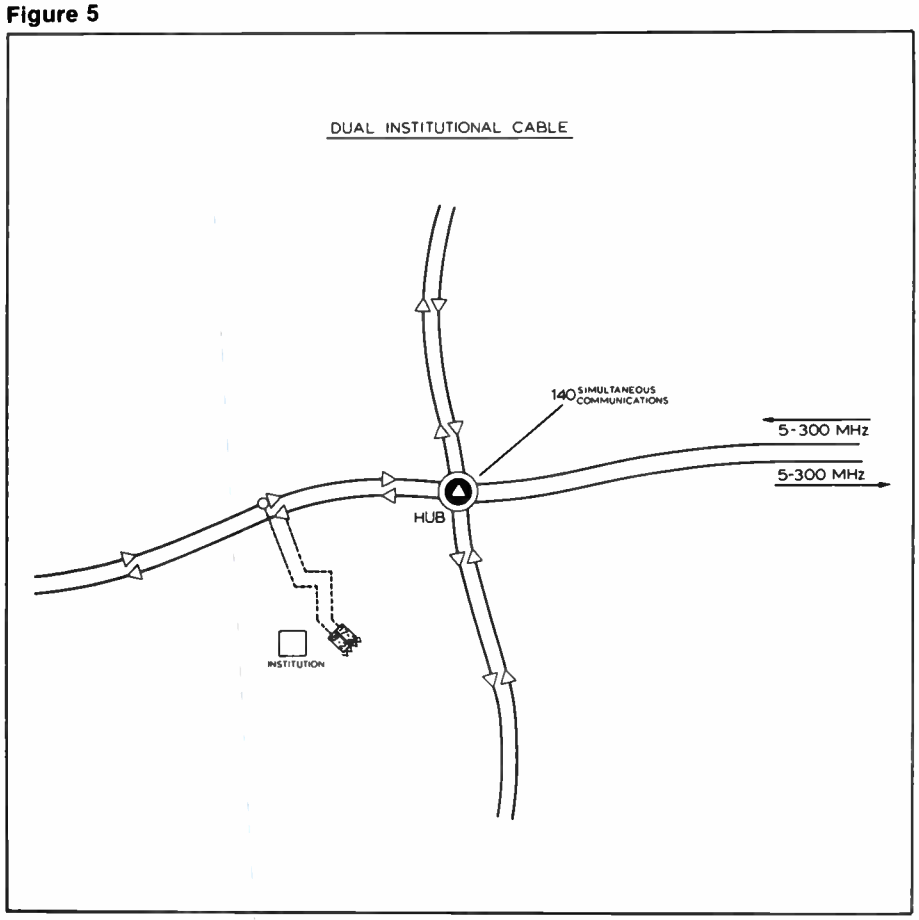
Figure 5



Multiplex Access/Collision Detection (CSMA/CO) philosophy and works on RF frequencies. All stations listen to the circuit. If the link is idle, the station requiring to transmit proceeds and listens for its own signal (echo) to confirm the transmission. Should two stations transmit simultaneously, the transmissions collide and each station attempts to retransmit after a random delay. 20 stations can be handled in a 300 KHz assignment, or 400 in a 6 MHz video channel.

Collision detection lives in the environment of small systems such as Local Area Networks. In large cable TV distribution systems long delays are to be expected due to cable propagation to reduced data transfer rates.

Level 2 architecture

Figure 4 (see page 17), shows a typical Residential Cable TV Distribution System featuring a Hub location in the geographic center with a number of trunk lines feeding the various parts of town. The more trunks you have emanating from the Hub, the better your position with respect to future data traffic, as we will see in a little while. Old-fashioned tree systems will require rebuilding.

Present Distribution System Architecture includes:

Single	Dual
300 MHz—35 ch	300 MHz— 70 ch

330 MHz—40 ch 330 MHz— 80 ch
400 MHz—55 ch 400 MHz—110 ch

All the above features, when equipped, a sub-low transmission band in the reverse direction which can carry 4 video, or 6 MHz assignments between 5-30 MHz on each cable.

In newer systems we also find an institutional loop, typically a mid-split Institutional System. Originally designed as a simple school interconnect system, it became a tool to obtain franchises—a give-away to the town. It is commonly pictured as the town's communications system for teleconferencing, city computer interconnect and city or countywide telephony. The spectrum consists of 21 channels in one direction and about 14 channels in the other direction.

When you look a little deeper into existing installations, you do not find much switching mechanism in the Hub to establish these services. Tele-Engineering Corporation developed the PVS-100 Programmer for 7-day switching of up to 96×96 video matrices, and up to 10,000 switching functions per week. We've only sold a few so far. But if the Institutional System would be extended into the industrial areas in town, it will become a powerful tool for voice, data and video.

Figure 5 shows a more powerful version of the institutional interconnect cable. It features 2 cables, 54-300 MHz, or

Figure 6

Manufacturer Model	System/Level
A. Distribution Scanning Systems	
Tele-Engineering Tele-Dat II TD-8900	Residential System Level 2
Tele-Engineering Tele-Dat II TD-9000	Institutional System Level 2
B. Point-to-Point Systems	
Scientific-Atlanta Series 6400	Institutional System Level 2
CATEL Series 3000	Regional Interconnect System Level 3

Phasecom has the only all "SAW"* line of headend electronics!

It's our cutting edge.

✽ SAW... it stands for "Surface Acoustic Wave" Filter. It makes for super reliable vestigial sideband signals with superior performance characteristics. Now it is being delivered in every modulator, demodulator and heterodyne processor that we make, standard or HRC.

A STEP AHEAD IN HEADENDS... this significant step forward in headend processing is exemplary of Phasecom's philosophy and effort to bring you "hands off" reliability as well as the best performance and price in the industry.

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35 channels in each direction. As we will see later, this cable arrangement seems to be the desirable architecture for high density traffic within the franchise area of a town or hub area.

Data rates and equipment

What kind of transmission rates can we then expect to handle in interconnecting Level 1 with Level 2 over cable TV distribution systems? Also, what kind of transmission rates can we expect to handle from single residencies?

Data rates for home services like security, energy management, data inquiries, meter reading and home banking or shopping will be 300 bps. Computer terminals and electronic mailing will use approximately 1,200-9,600 bps. Data rates for business services like security, data inquiries and energy management would be comparable to that of home services. But data requirements would be substantially more at 9.7-56 Kbps, while digitized voice would use 64 Kbps and PCM combined T1 would use 1,544 Mbps. All data rates from homes are essentially low or medium speed. There may be a high speed requirement in the forward direction to the home such as video or page selection.

What kind of equipment is available to carry these data rates on the Level 2 residential and institutional networks of a cable distribution system? There are many equipment developments in existence that I could not begin to describe because of lack of space. Just to name a few: Pioneer, E-Com, AMDAX, Tele-Engineering Corp., Scientific-Atlanta, CATEL and many more are entering the market every day.

What I would like to do is to concentrate on one type in each of the equipment categories in order that we can engineer the Level 2 and Regional Level 3 data transmission system. The two basic categories of data transmission are shown in figure 6 (see page 21).

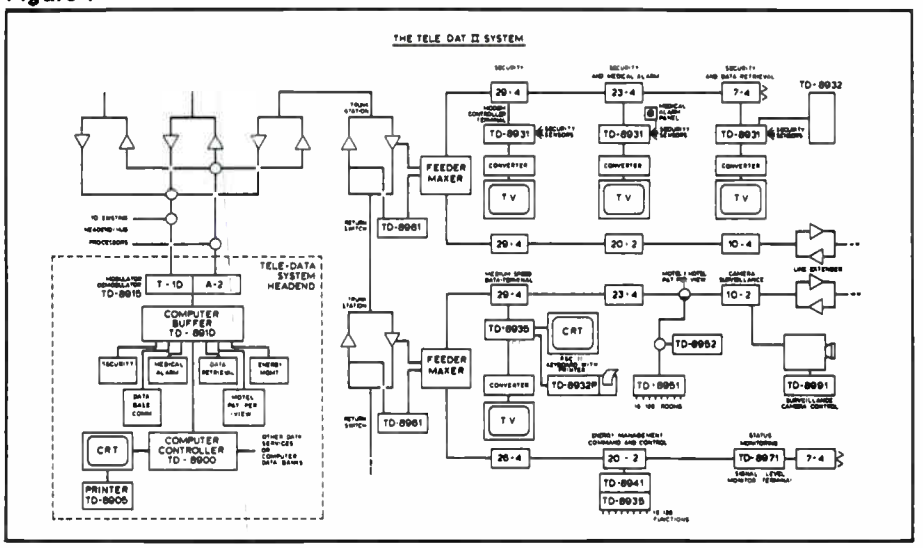
Distributed scanning equipment

A distributed scanning system such as the TD-8900 can handle up to 65,000 low speed terminals anywhere on the residential system. With 1 Mbps scanning rate, all terminals are addressed and have responded in less than two seconds.

Figure 7 (see page 24), shows the general purpose of the TD-8900 design and its usefulness for a variety of data services such as security, energy management, camera surveillance, data inquiries and home computer data transmission

There can be up to 16 different service categories within one system. Each category has a separate RS-232C port through which the data stream can either be connected to the telephone net or to PCM multiplex equipment for Level 3

Figure 7



(Regional Interconnect) transmission. Data terminals talking to each other on the same system are coupled by an interlinking of two RS-232C ports. The front end computer is used for system status monitoring and billing records.

The Tele-Dat II, TD-8900, system transmits an address of 16 bits and an 8-bit command signal to any terminal. In turn, the terminal answers, when addressed, with a 4-bit category code and 8 bits of information. The TD-8900 scans each terminal in the sequence of near to far on each trunk station area and expects an answer in accordance with a precisely measured delay time.

Should a terminal fail to respond, an instant alarm is noted on the first scan cycle. Each terminal is equipped with a communication bit, a power standby bit, tamper switch bit and a converter disconnect bit. The alarms are registered in the system computer front end and alert to immediate maintenance and follow-up action. In the forward direction, up to eight commands are available for pay-per-view, energy management or other forward messages.

A terminal modem controller can be expanded to a medium speed data terminal by multiple addressing. Speeds up to 9,600 bps can be accommodated in one unit. (See figure 8, page 27).

For data applications, an RS-232C interface module is added permitting a direct interface with an ASC II terminal. The beauty of this design is the multi-purpose use of a Modem controller terminal. At the same time, it can serve as a security modem, an energy management controller, a slow speed data inquiry unit, a pay-per-view controller and a medium speed data modem.

This means that five or more categories of service can be accommodated in the same unit and all separately billable. The unit is of rugged construction, designed for garage or basement installation and features a 4-hour power standby battery. Multiple security services can be provided on one system, simply by assigning appropriate category numbers. Medical alarms can go directly to the operating ambulance service or hospital. Multiple energy management control systems can also be established on the same system. Competition is invited.

The cable operator is the transmission company and provides the opportunity to operate energy management services to any new local venture that desires to do so. Data base computer connections can be offered to any subscriber with a home terminal. The RS-232C interface is a part of the modem controller. Various data base and home computer-to-home computer connections can be accommodated on the same system. This system incorporates the flexibilities that are dictated by the cable TV industry. The operator can offer one service category and add other service categories as they become available, or when they appear to be revenue producing.

The Tele-Dat II, TD-8900 system, operates with pulse width modulation in order to assure a high resistance to ingress noise. Noise tests have been conducted and indicate error-free transmission at signal-to-noise ratios of 16 to 18 dB. The use of pulse width modulation, however, reduces the spectrum capability of the system limiting data transfer speeds to 9,600 bps.

The Tele-Dat II, TD-9000 system, is in design for use on the institutional network. Here, ingress noise is not a problem and better signal-to-noise ratios can be assured. Utilizing phase modulation, a much improved handling capability will be achieved. Speeds up to 56 Kbps can then be handled with the same distributed scanning concept.

Point-to-point equipment

The Scientific-Atlanta Series 6400

point-to-point modem can handle T1 speeds of 1544 Mbps in a small portion of a video channel assignment. Figure 9 shows the direct connection between two businesses requiring voice and data over broadband cable using the Series 6400 RF modem. Scientific-Atlanta features Model 6402 modem transmitting data rates of 1.544 Mbps in a 750 KHz band. Model 6403 modem features data rate of 1.544 Mbps in a 500 KHz band. The goal is a T2 modem carrying 4 T1, or 1.544 Mbps data streams on one video channel. Modulation is coded amplitude phase shift keying requiring signal-to-noise ratios of better than 30 dB.

This equipment is then ideally suited for point-to-point applications over mid-split or dual 300 MHz (Level 2) institutional network. It is not a good approach on sub-split residential systems with high ingress noise contributions.

One comment has to be made relative to the D4 terminal equipment shown. The D4 channel bank can derive 48 voice channels out of a T1C (3.152 Mbps) circuit. The D4 channel bank belongs to a family of commercially available PCM multiplex equipment. T1 carriers at 1.544 Mbps can transmit 24 voice channels using a D3 channel bank.

Commonly used data rates for information and digitized voice are shown in

Figure 10

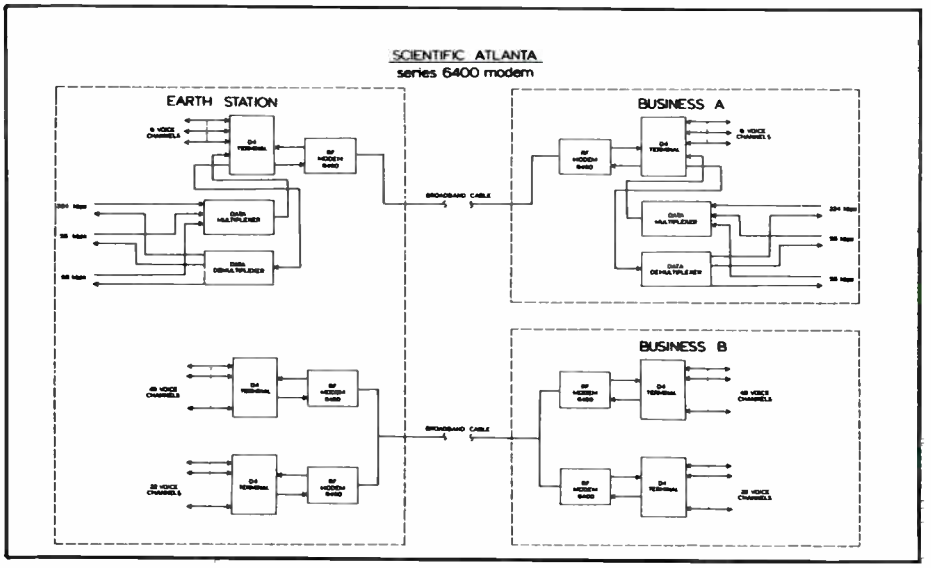


Figure 10. Figure 11 (see page 31), shows the block diagram of a CATEL, Series 3000 FM, modem in combination with a TRW/Vidar, DM 12A, PCM multiplexer. The Vidar equipment combines 12 T1 circuits, or 12 × 24 voice channels (288) into a 19 Mbps data stream that is fed into a 15 MHz CATEL FM modem. At the earth station, the 19 Mbps bit stream is demodulated and fed to either earth station or central office. This concept is compatible with Bell PCM hierarchy and broadcast quality video signal.

The utilization of FM technology makes this transmission system an outstanding tool for Level 3 transmissions. FM technology permits the cascading of cable TV amplifiers without inherent cumulative noise effect. This means that transportation trunks interlinking cable system hubs can be designed and will transport integrated video voice and data streams over long distances without signal degradation.

Figure 8

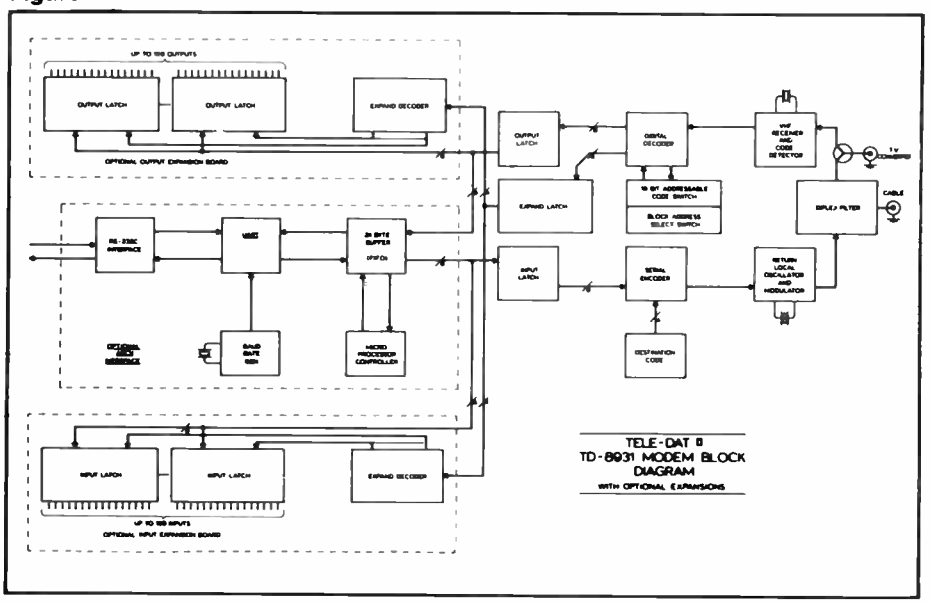


Figure 9

Multiples of 1.2 Kbps	**1.2; 2.4; 4.8; 9.6; 19.2 Kbps**
Multiples of 56 Kbps	**56, 112, 224, 448 Kbps**
T1	**1,544 Kbps = 24 voice**
T1C	**3,152 Kbps = 48 voice**
T2	**6,312 Kbps = 96 voice**

Common Data Rates

Level 3 architecture

Now that we have taken a look at the available building blocks for data and voice transfer on coaxial cable, we can model the broadband transmission system of the future. We see the long distance segment of the broadband voice/data/video network accomplished by satellite transmission. A geographical region will feature a Regional Communications Center (RCC) that becomes the Central Office for regional broadband communications. Coaxial 0.75" transportation trunks are connecting the RCC with the individual cable system hubs (Level 3).

The cable system hubs are the collection and routing points for local broadband transmission within the cable system area (Level 2). Level 1, the in-plant broadband communications system is not shown, but can easily be visualized (see figure 12, page 32).

Microwave and fiber optic links can be used for some applications in the Level 3 regional interconnect. As we will see in the following, however, it appears that microwave has inferior traffic capacity handling properties if compared with coaxial cable. Fiber optics, on the other hand, is a technology that may be considered for short distances. The state of the art is such that many years will go by

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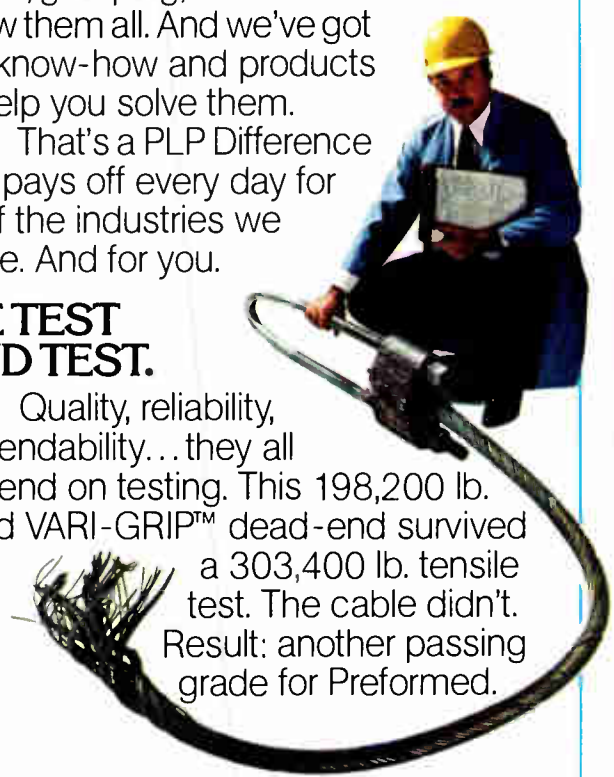

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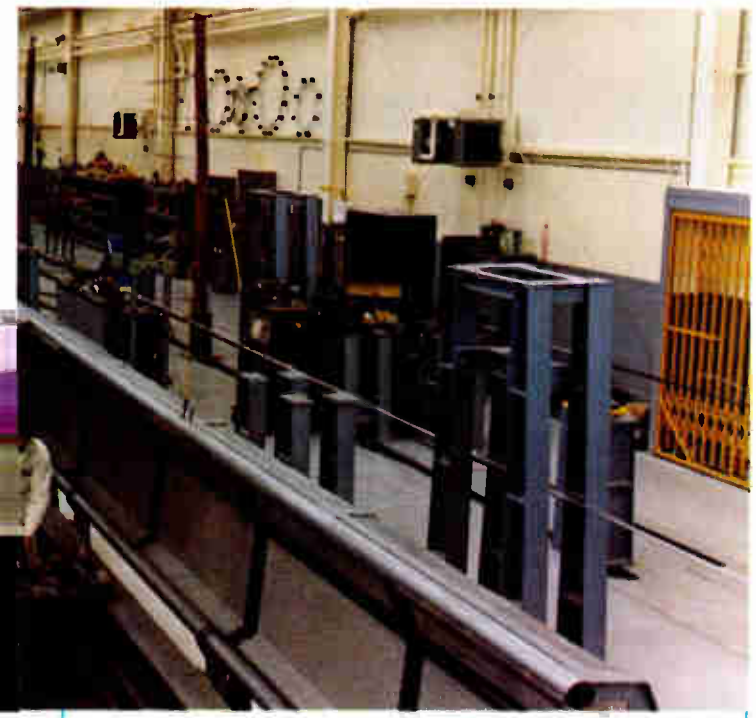

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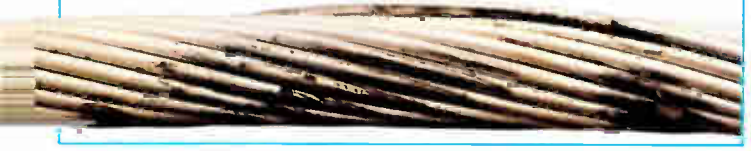

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before fiber can truly be recognized as a broadband long distance medium and compete in a cost effective manner with coaxial cable. A look at the spectrum efficiency of coaxial cable transmission systems will prove this point (see figure 13, page 31).

Level 2: Frequency utilization

Level 2 is the local hub area cable TV system consisting of the Residential and Industrial cable systems. The forward spectrum of the residential system is predominantly reserved for entertainment video. There are, however, two unused video assignments that qualify for data transmission. In our example. A-1 and T-10 are used for Tele-Dat II, TD-8900, Distributed Scanning System Transmission.

Due to marginal signal-to-noise conditions on the sub-low return spectrum, this transmission may not be feasible without the use of feeder branch switching equipment at trunk amplifiers. Proper hub design calls for 3 or 4 trunk lines serving separate segments of a town. Assuming such an architecture, a total of 8 Tele-Dat II systems and up to 520,000 low speed terminals could be accommodated. For voice/data transmission, the frequency spectrum of the Industrial Cable in a mid-split configuration is more appropriate.

One channel assignment has been used for Tele-Dat II distribution scanning system. Video needs for teleconferencing and video origination programs are covered by reserving 3-channel allocations. This leaves us with 8 video allocations or 48 MHz that can be used for voice/data systems. Using the S.A. Series 6400 modems, 32 T1 systems or 56 Kbps data circuits can be accommodated.

The lopsided nature of the mid-split cable is further enhanced by the fact that transmission around IF frequencies is not feasible. As a result, there are 8 unused forward video channel assignments that may be used for forward high speed data or teletext.

Next, we have the dual 300 MHz Institutional/Industrial System (see figure 14, page 36). Here, we find a total of 40 two-way video channel assignments. Assuming that we set aside 2 channels for Distributed Scanning Systems (Tele-Dat II, TD-9000), we could serve 130,000 low and medium speed terminals on each trunk. Setting aside 5 channels for video teleconferencing and program origination, a total of 33 video channels are available for voice/data traffic. Using S.A. Series 6400 modem equipment, a total of 132 T1 systems with 3,168 digitized voice or 56 Kbps channels can be accommodated.

This is a powerful voice/data and video transmission system that certainly could satisfy all voice and data needs

within the Level 2 community for many years to come.

Level 3: Frequency utilization

Traffic engineering dictates that a substantial number of communications conducted by businesses are of regional and long distance nature. Unless a company has located all its facilities within a cable system area, it will require communications to locations outside the system area.

Substantial traffic requirements then exist between the Hub and the RCC. Figure 15 (see page 38), indicates the powerful capacity of a dual 400 MHz system. There are 55 video channel allocations in each direction. Because of the length of this dual .750 transportation trunk, we will use CATEL FM, Series 3000 modems and divide our frequency spectrum into 16 MHz slots. The result is 21 FM video assignments that could be arranged as five video plus 16 voice/data channels. This choice will produce 192 T1 systems with a total of 4,608 digitized voice or 56 Kbps circuits.

Level 3—the missing link

As we see in figure 16 (see page 38), it is not necessary to run a dual 400 MHz cable between each hub and the RCC. The number of interconnect cables is a direct function of the traffic requirement. Figure 17 shows a single, a dual and a triple regional system with shared spectrum utilization.

Even in the case of the triple shared system, an average of 60 T1 systems (1440 voice) and two video channels can be accommodated for each of the three

Figure 11

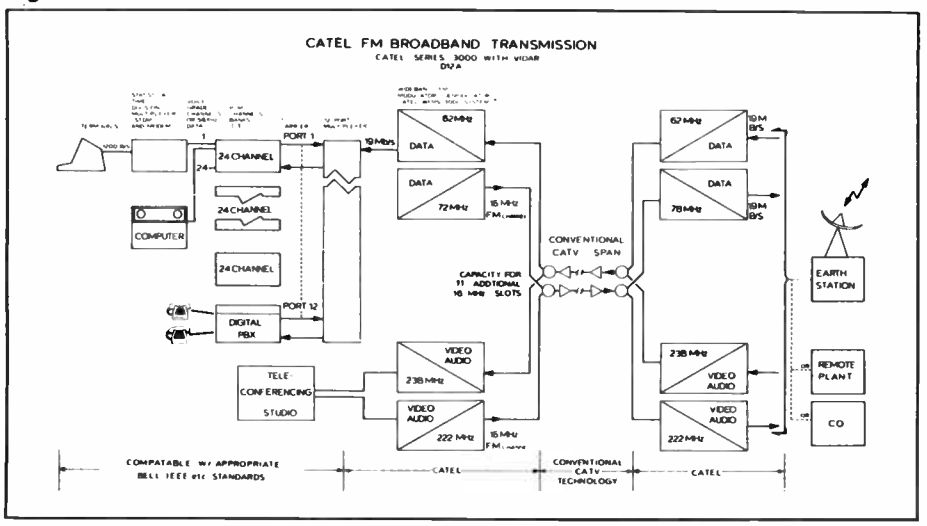


Figure 13

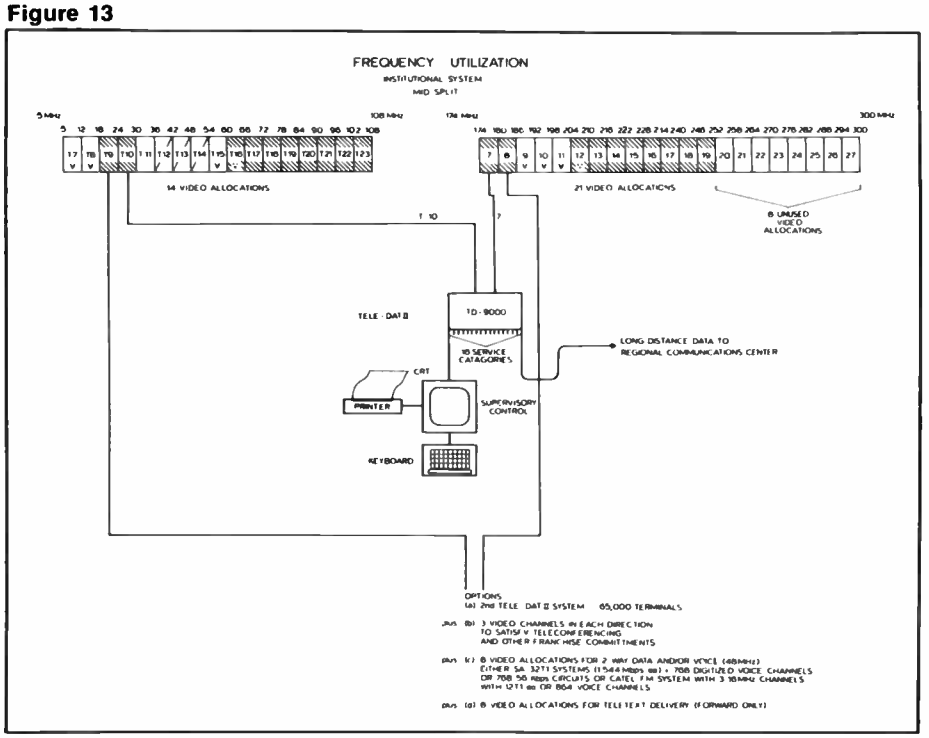
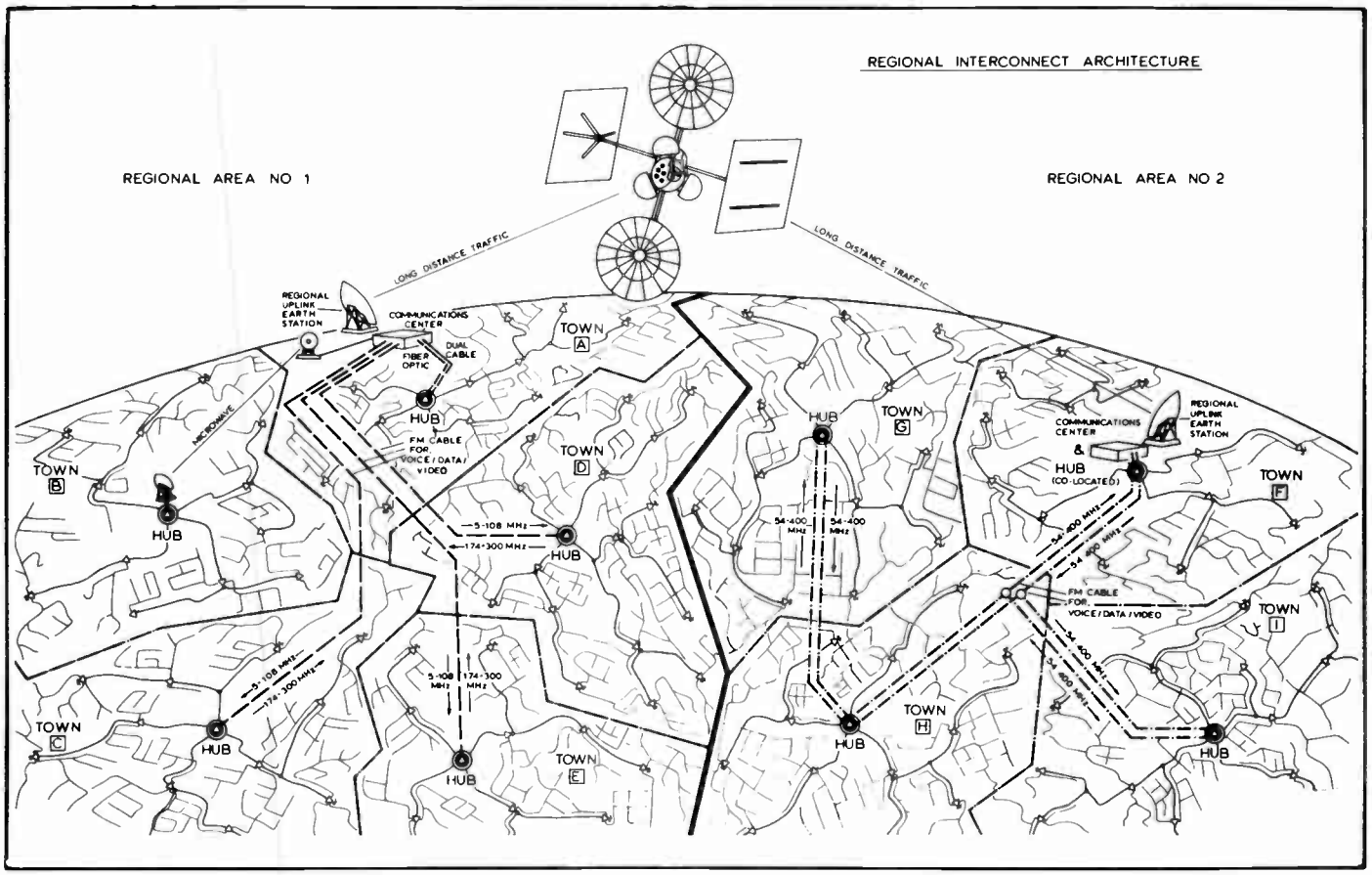


Figure 12



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hubs. There is complete flexibility in system design and traffic engineering. Standard cable TV design practices apply. Shared facilities can be upgraded to dedicated links by overlashing two more cables in the shared section.

Both microwave and fiber optics would have a hard time competing with such a simple architecture. It appears that coaxial broadband facilities are the correct choice at this time and for many years to come.

One word of caution with respect to reliability. It appears essential to keep outages of such a facility to an absolute minimum. An availability of 99.99 percent is recommended. Such a reliability can only be assured by employing standby power supplies with no-break features and fully redundant trunk amplifiers. In addition, sophisticated status monitoring equipment should be used that will provide a computerized evaluation of signal levels and carrier-to-noise ratios measured at all amplifier stations.

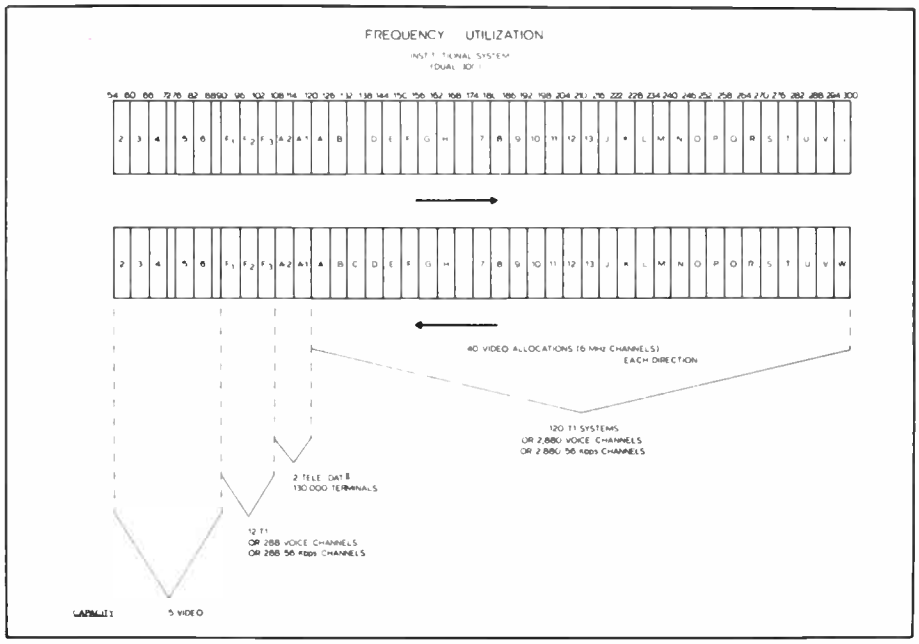
I have covered the transmission properties of both Level 2 and Level 3 broadband systems to some extent in the foregoing. Let us now have a look at the equipment complement that will be required at the various locations.

Level 2 Hub Sites

The Level 2 hub site presently may incorporate some modulator and alpha-numeric generators for automatic news channels, local origination and public access. The equipment layout of the future will require routing and switching equipment for video; routing and switching equipment for distributed scanning systems such as the Tele-Dat II, as well as data multiplexers and routing/switching equipment for point-to-point data transmission.

Figure 17 (see page 45), indicates these 3 separate routing and switching categories. On the left, we see the equipment arrangement for video channel switching. Utilizing a standard PVS-100 7-day programmer with video switching matrices, video channels can be switched

Figure 14



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The Agile 24 receiver system carries Standard's full technical support. System installation and alignment is facilitated by enlarged schematic diagrams and an illustrated technical manual. Standard's field engineers offer operator training as well as on-site repairs. Where factory service may be required, 48-hour turn-around and a loan equipment plan are available to minimize system downtime.

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Figure 15

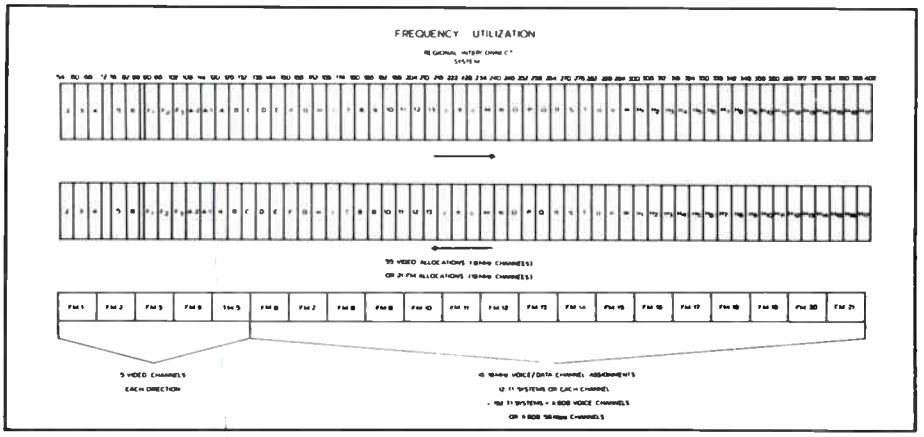
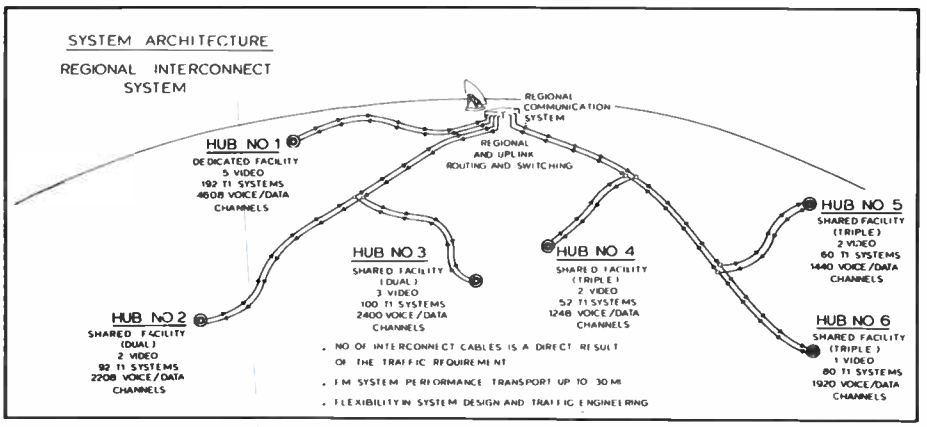


Figure 16



on a programmed basis between institutional loops and the residential system as well as between the Residential/Institutional systems and the Regional Communications Center (RCC). All programming is controlled and recorded from a CRT with keyboard and printer. All equipment is available now.

In the middle, we see the Distributed Scanning System Computer with 16 RS-232C outputs that can be arranged for loop back into the system, connected to the telephone line or transferred via D3 PCM terminals into the high capacity bit stream to the RCC. A CRT with keyboard and printer acts as system status monitor, supervisory control console and record keeper for billing. All of this equipment is available now.

To the right, we see voice/data modems (S.A. Series 6400), D3 or D4 PCM multiplexer banks, T1 routing switch matrices as well as 56 Kbps switches to provide switched traffic between two institutional loops, as well as from the institutional loops to the RCC. The supervisory and record control console is shown at the bottom. Sixteen MHz FM modems (CATEL 3000) are shown on the extreme right to transfer voice/data and video to and from RCC. All of this equipment is available now.

The cable TV system Hub will become the communication center for (Level 2)

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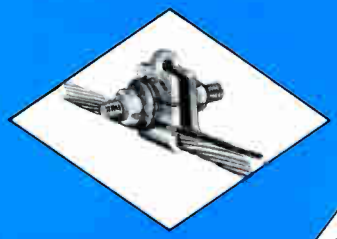

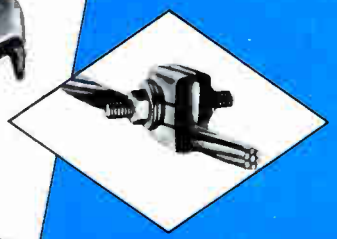

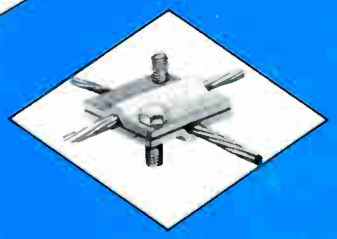

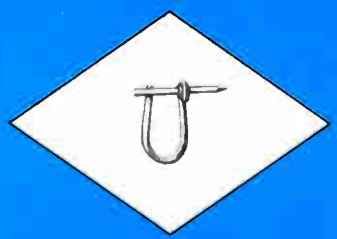

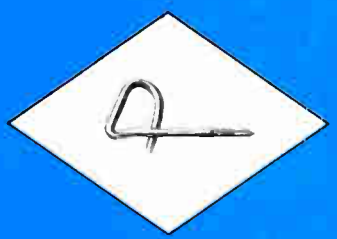

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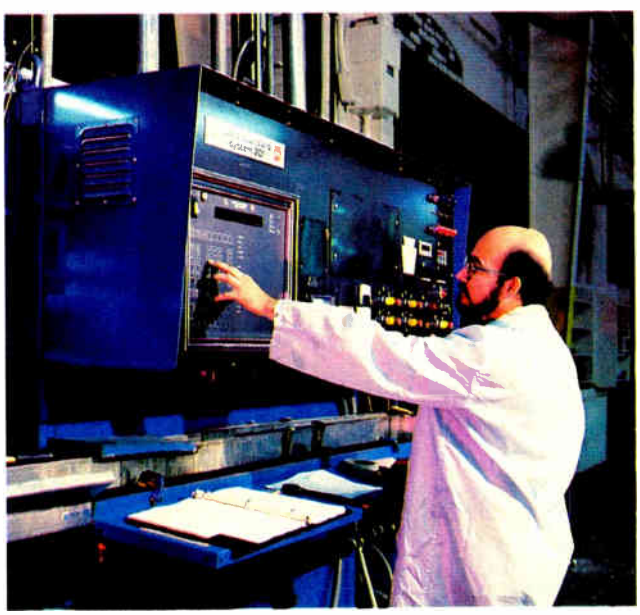

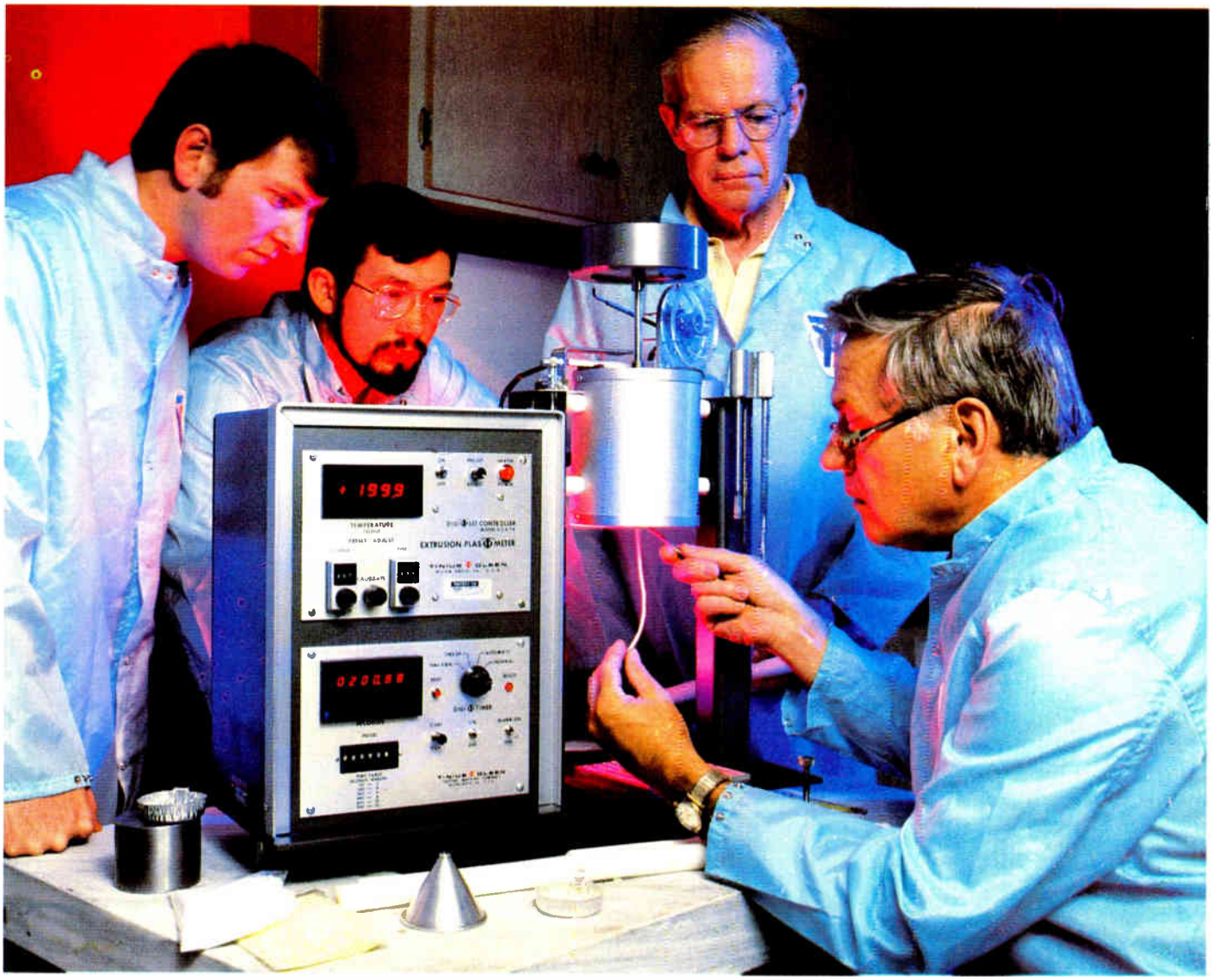

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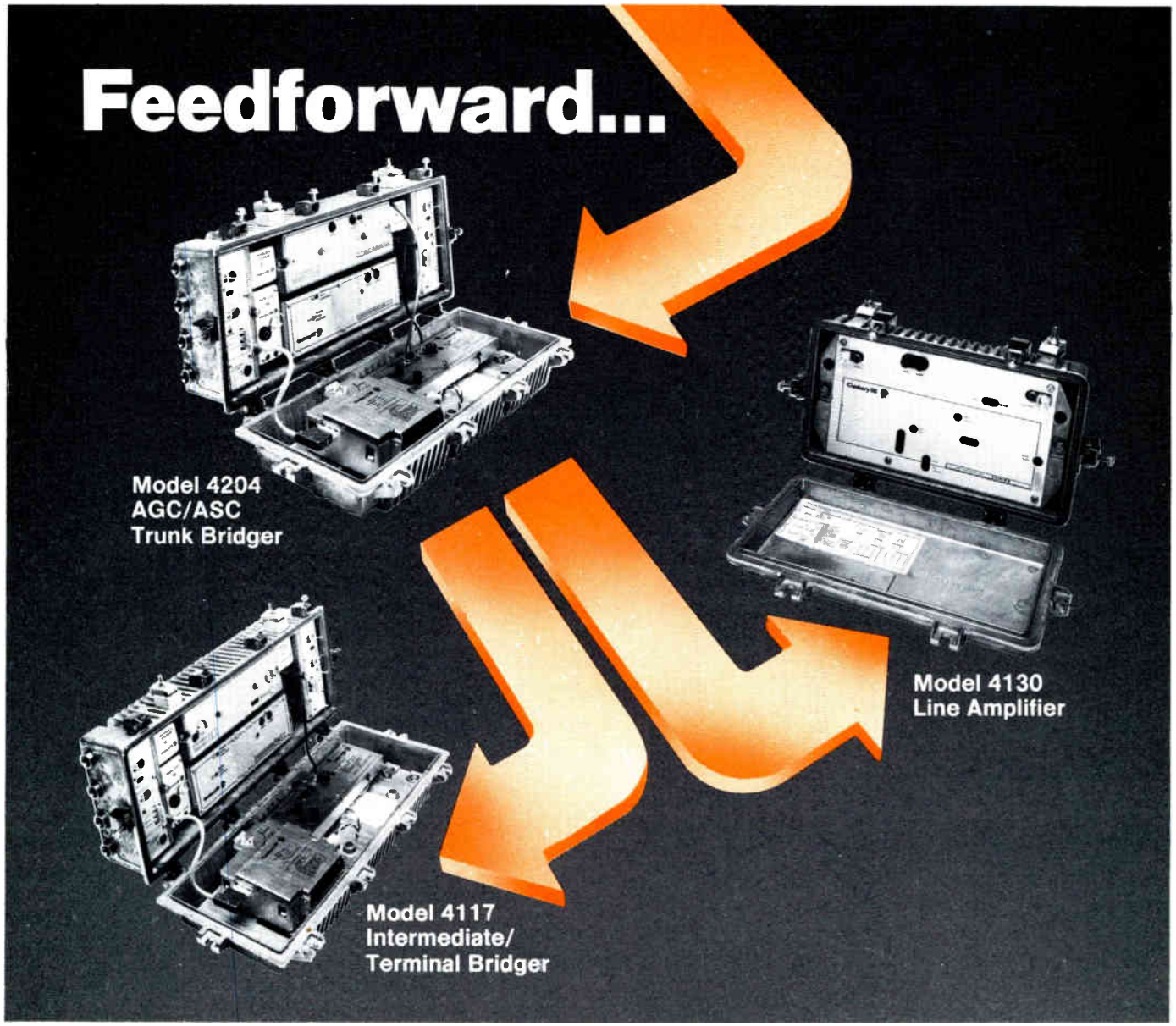

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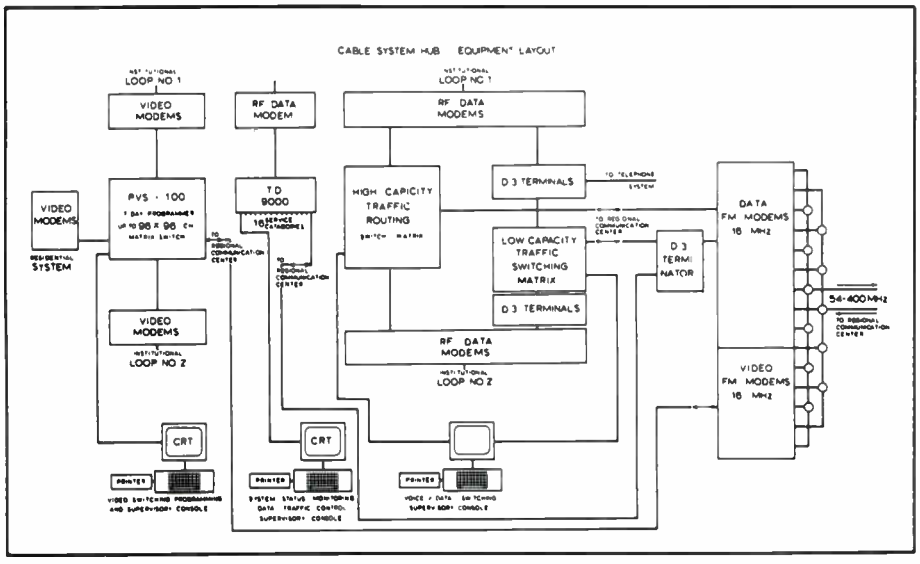
Figure 17



switched broadband traffic within the Hub area, as well as for regional and long distance traffic (Level 3 and 4).

Level 3 RCC equipment

The Regional Communication Center (RCC) acts as the switching point for regional and long distance broadband traffic. Its equipment complement is similar to that of the Hub center except more powerful. Figure 18 (see page 46), shows coaxial cable facilities entering on the left from four different hub sites. Each of the broadband transmissions received consists of video and voice/data. The video channels are routed to PVS-100 video matrix switches that arrange for the circuit switching to either or both distant hub sites (regional traffic), or to the earth station facility (long distance traffic). In a very similar manner, 19 Mbps data (12 T1 channels) are switched between regional and long distance traffic. Lower speed voice/data transmissions are switched at the 56 Kbps level (voice channel) after going through 12-port PCM multiplexer and D3 channel banks.

It can readily be seen that good compatibility between video and voice/data exists and that there is total flexibility in circuit routing and traffic grouping. The detailed design of a Regional Communication Center only depends upon initial traffic requirements and growth projections.

Summary and conclusions

In summary, we conclude that two-way cable TV technology, as it is presently used for the delivery of entertainment video, can become a powerful voice/data and video carrier.

The equipment technology also is commercially available to form local, regional and long distance segments for high speed data and digitized voice transmission. Broadband switched networks can and should be developed now to satisfy the information transfer requirements of the '80s.

The cable operator has to familiarize himself with the technology of broadband data/voice communications in order to be able to partake in the ongoing communication explosion. The rewards are many times those that can be derived from the delivery of entertainment services.

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More On Stereo Satellite Audio Formats

*The February issue of **CED** contained a tutorial article on stereo satellite audio services by David Large of Gill Cable Television, a rebuttal by Dom Stasi of Warner Amex and a further tutorial by Ned Mountain of Wegener Communications. In the interest of furthering discussion of the relative merits of various systems, we present here Mr. Large's reply.*

In his rebuttal to my article on stereo services (**CED**, February 1982), Mr. Stasi apparently misunderstood some of the issues that were raised. I would like to take this opportunity to clarify them.

Subcarrier Frequency

That the choice of 6.62 MHz for the L+R subcarrier frequency was made by marketing may remove that issue from a discussion of the relative merits of the transmission method, but it certainly does not remove it as an engineering issue. If a standard 6.8 subcarrier were employed, then I as an operator could use a normal 6.8 subcarrier demod as a backup monaural audio feed should the stereo processor fail. This would go a long way toward equalling the redundancy inherent in the CBS system with its separate 6.8 monaural subcarrier.

I might add, though, that were I an operator who felt that simulcast television sound was of limited value to my total basic product, I would certainly object to a program supplier attempting to force me into that option because he felt that he knew better than I how to package my service.

Microwave Linked Signals

Mr. Stasi apparently is under the impression that we would promote the use of a standard baseband video output for subcarrier recovery. As he points out, this port is specifically low-pass filtered to eliminate such signals. We, of course, are well aware of that. On the other hand the MICRODYNE 1100 TVR (X24) receivers we use provide means for removing the low pass filter so as to create a true wide bandwidth deemphasized output including the subcarrier structure. Since accessing subcarriers at a different port than video requires the special filtering outlined in my article so as to be fed to an FML link, I was merely expressing my disappointment that a wide bandwidth deemphasized signal was not usable as it is with the CBS format. Since writing the original article, we have done further research, and have tentatively concluded that wideband deemphasized output without low-pass filtering may, indeed, be usable, certainly good news for operators with remote TVRO's.

Dolby Encoding

I do not for a minute dispute the many advantages of Dolby noise reduction techniques, nor do I dispute Mr. Stasi's analysis of the limitations of standard satellite sound transmission techniques. I fully agree with his reasons for wider subcarrier deviation and only mentioned it is "non-standard" to alert operators that it does not conform to that most commonly used deviations for satellite delivered television sound subcarriers.

My point on Dolby encoding was merely that since the currently installed base of Dolby equipped FM receivers is so low, the noise reduction advantages will largely be lost. All lofty motives on our part aside, the chances of the consumer electronics industry significantly changing its interest in Dolby FM techniques because of the presence of a handful of cable television auxilliary audio services seems rather slim.

Standards

At the SCTE Spring Engineering Conference in Boston, Ned Mountain, in his excellent presentation, stated what I feel to be the most rational position on standards. He agrees with the need but feels that the time for setting those standards is two years from now when the market and the technology are more mature.

David J. Large joined Gill Cable TV four years ago, has held the position of Chief Engineer, and was recently promoted to the position of Vice President of Engineering. His previous five years were spent as head of the CATV engineering group at Avantek. He holds a BSEE from the California Institute of Technology and is a Senior Member of the SCTE.

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Product Profile

This month's **CED** product profile features video/audio modulators. Used in cable operating system headends, the device is typically rack-mounted in configuration with demodulators which allow for the implementation of external switching capabilities. While the mod/demod with switching configuration is more costly than the use of processors, its headend alternative, the mod/demod approach, permits greater flexibility for the system operator, particularly those carrying a broad range and mix of programming services.

An attempt has been made to identify critical specifications for the models featured in spite of the complexity and variety of modulators on the CATV hardware market. For the purpose of comparison, those modulators primarily designed for CCTV or MATV applications have not been included.

Most manufacturers offer several options that are delivered factory installed while others offer a modular design so that system operators can configure and/or replace modules as needs dictate. Several models permit employing incremental or harmonic system operation. Eight of the 14 models shown in the following chart feature a surface acoustic wave vestigial sideband filter either as a standard special feature or as an option, and as many offer phase lock capability as well. All models can be mounted in the standard EIA rack (19" wide) including the Phasecom models which can be mounted two side-by-side or one with a blank extender.

The basic unit cost (without options) will vary depending upon the amount purchased and other factors. As usual, **CED** suggests that the manufacturers be consulted for costs and any other information required for design and purchasing decisions.

Signal processors, demodulators and other headend equipment, along with the many other equipment elements of operating CATV systems, will be featured in future issues of **CED** magazine. Next month's **CED** Product Profile will feature two-way interactive cable residential security systems.

Video/Audio Modulators

Model	Output Frequency	Output Level	Aural to Visual Ratio	Spurious Outputs	IF Input Level	Input Level	Differential Gain and Phase	Tilt or Sag	Input Level
Blonder-Tongue Laboratories, Inc., Old Bridge, New Jersey									
TVM 4930	Chan. 2-13; optional sub-band, IF, Mid-band, Super-band	+56 dBmV, range 14 dB	-10 dB to -20 dB	-60 dB at full output		.5V peak to peak for 87.5% depth of mod.	1dB; 3° adjustable to 1°		245 mV rms for 25 KHz deviation
CADCO, Garland, Texas									
Mod. w/Processor option	Chan. T7-13, mid-band, super-band, HRC	+60 dBmV	-10 dB to -20 dB	-60 dB at full output	+40 dBmV ±3 dBmV	.5V peak to peak for 87.5% depth of mod.	.5 dB; 1°	1% on 60 Hz sq. wave	.25 V rms for KHz deviation
Catel, Santa Clara, California									
TM-2300	Chan. 2-13, mid-band, super-band	+54 dBmV	-12 dB to -27 dB	-60 dB at full output		.5V peak to peak for 87.5% depth of mod.	.5 dB; 1°		
TM-2400	Chan. 2-13, mid-band, super-band	+54 dBmV	-12 dB to -27 dB	-60 dB at full output		.5V peak to peak for 87.5% depth of mod.	.5 dB; 1°		
Electron Consulting Associates, Grove, Oklahoma									
ECA Mod.	Chan. 2-13, mid-band, super-band	±57 dBmV	-6 dB to -20 dB	-60 dB at full output	N/A	Less than 1 V peak to peak for 87.5% depth of mod.	N/A		
Fung Engineering, San Carlos, California									
IF TM-4170	Chan. T7-13, mid-band, super-band hyper-band	+56 dBmV	-3 dB to -20 dB	-60 dB at full output	N/A	1 V peak to peak for 88% depth of mod.	1 dB; 2°		
Gardiner Communications Corporation, Houston, Texas									
TM-2400	Chan. 2-13, mid-band, super-band	+54 dBmV	-12 dB to -27 dB	-60 dB at full output		.5 V peak to peak for 87.5% depth of mod.	.5 dB; 1°		
Jerrold Division, General Instrument Corporation, Hatboro, Pennsylvania									
CMMS Commander IV	Chan. T7-13, mid-band, super-band HRC	+66 dBmV	-5 dB to -25 dB	-60 dB at full output	+37dBmV ±5 dB	.5 V peak to peak for 87.5% depth of mod.	.25 dB; .5°	1% on 60 Hz sq. wave	250 mV rms for 25 KHz deviation
Phasecom Corporation, Los Angeles, California									
2106	T7-13, mid-band, super-band hyper-band	+60 dBmV	-10 dB to -40 dB	-60 dB at full output	+33dBmV ±5 dB	.75 V peak to peak for 87.5% depth of mod.	.5 dB; .5°	1% on 60 Hz sq. wave	.4 V rms for 25 KHz deviation
2176	T7-13, mid-band, super-band hyper-band HRC	+60 dBmV	-10 dB to -40 dB	-60 dB at full output	+33dBmV ±5 dB	.75 V peak to peak for 87.5% depth of mod.	.5 dB; .5°	1% on 60 Hz sq. wave	.4 V rms for 25 KHz deviation
Precise Manufacturing Company, Tempe, Arizona									
Mod.	Chan. 2-13, mid-band, super-band hyper-band	+60 dBmV	-5 dB to -20 dB	-60 dB at full output	+40dBmV	.75 V peak to peak for 87.5% depth of mod.	.5 dB; .5°	1% on 60 Hz sq. wave deviation	.75 V rms for 25 KHz
RCA Cablevision Systems, Van Nuys, California									
CTM 11	Chan. T7-T11, 2-13, mid-band, super-band hyper-band	+60 dBmV	-10 dB to -20 dB	-60 dB at full output	+48dBmV ±.5dB	.5 V peak to peak for 87.5% depth of mod.	.3 dB; .5°	1% on 60 Hz sq. wave	250 mV rms for 25 KHZ deviation
Scientific-Atlanta, Inc., Atlanta, Georgia									
6350	Chan. 2-13, mid-band, super-band hyper-band	+60 dBmV	N/A	-60 dB at full output	N/A	.5 V peak to peak for 87.5% depth of mod.	18 dB; .5°	1% on 60 Hz sq. wave	200 mV rms for 25 KHZ deviation
Triple Crown Electronics, Inc., Rexdale, ON									
TSP-M	Chan. T7-13, mid-band, super-band	+45 dBmV	-10 dB to -20 dB	-60 dB at full output	+40dBmV	1 V peak to peak for 87.5% depth of mod.	.5 dB; 3°	1% on 60 Hz sq. wave	250 mV rms for 25 KHZ deviation

Input Impedance	Freq. Response:	Metering	Controls:	Size H-W-D	Special Features	Options	Basic Unit Cost:
600 ohms balanced	50Hz to 15 KHz, ±1 dB	Mod. meter, overmod. indicators for A/V.	Output level control, A/V ratio control, video level control, phase trimmer control.	1¾" x 19" x 11"	Balanced MIC input with XLR connector; vestigial sideband filtering for adjacent channel systems.	Channel lock module; FCC group delay pre-correction network; video low pass filter; A/V AGC; video AGC; A/V separator	$1,066
600 ohms balanced	50Hz to 15 KHz, ±1 dB	Mod. meter,	N/A	3½" x 19" x 14"	SAW-VSB filtering.	Processor plug-in; phase lock; FCC predistortion; video low pass filter; output up converters.	N/A
600 ohms balanced	50Hz to 15 KHz, ±1 dB	Illuminated mod. meter	A/V level controls	3½" x 19" x 12"	Step attenuator output control; ten pole band pass filter; tamper guard front panel.	FCC group delay predistortion; non-standard connectors. output up converters	$1,295
600 ohms balanced	50Hz to 15 KHz, ±1 dB	Mod. meter,	A/V level controls	3½" x 19" x 12"	Channel change by P.C. board assembly; ten pole band pass filter.	FCC group delay predistortion; non-standard connectors.	$945
600 ohms	10 Hz to 15 KHz, ±.5 dB	N/A	N/A	5" x 19" x 6"	SAW filter for vestigial sideband; phase lock.	N/A	$714
600 ohms balanced		Mod. meter.	A/V level controls; visual/aural controls.	3½" x 19" x 14"	Adjacent channel operation	SAW-VSB filters; video switcher; data controlled switcher; IF only output.	$820
600 ohms balanced	50Hz to 15 KHz, ±1 dB	Mod. meter	A/V level controls.	3½" x 19" x 12"	Channel change by P.C. board assembly; ten pole band pass filter.	FCC group delay predistortion; non-standard connectors.	N/A
600 ohms balanced	50Hz to 15 KHz	Video mod. and audio deviation meter	5 function switch for metering; front panel test points.	3½" x 19" x 17"	AGC; emergency alert override; slide-out drawer for maintenance; in-band scrambling compatibility; FCC group delay predistortion.	Phase lock; video and audio switch; timer controlled switching.	N/A
600 ohms balanced or unbalanced	20Hz to 15 KHz, ±1 dB	N/A	Front panel test points.	3½"x8.35"x14", two side-by-side or with extender.	SAW filter at IF; AGC; internal band pass filter; FCC group delay predistortion.	N/A	$895
600 ohms balanced or unbalanced	20 Hz to 15 KHz, ±1 dB	N/A	Front panel test points.	3½" x 8.35"x 14", two side-by-side or with extender	SAW filter at IF; AGC; internal band pass filter; FCC group delay predistortion.	HRC system frequency synchronizer; HRC unity gain divider (8 way active splitter).	$1,775
600 ohms unbalanced	20 Hz to 20 KHz, ±1 dB	A/V mod. LED indicator	N/A	3½" x 19" x 14"	SAW filter.	Phase lock.	N/A
600 ohms balanced	50 Hz to 15 KHz, ±.75 dB	Six function meter module	Front panel test points.	5¼" x 19" x 16"	Automatic IF end aural switching; SAW filter.	High level IF switching; AGC; microwave aural carrier; baseband audio or microwave aural carrier; phase lock; meter module.	$1,435
600 ohms balanced	30 Hz to 15 KHz, ±.5 dB	Three function meter module	Front panel test points.	3½" x 19" x 19½"	SAW filter; FCC group delay predistortion.	Phase lock; automatic video switching; AGC; audio switch; audio mod limiter; IF switch; spectrum inversion; meter module.	$1,340
600 ohms balanced	50 Hz to 15 KHz, ±1 dB	N/A	Front panel test points.	3½" x 18" x 9"	Video and audio switching.	Phase lock.	$950

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People News

Fred Meyer

★ **Fred Meyer** has been appointed technical director at **TRW Semiconductors**. Meyer has been with TRW Semiconductors for over 10 years, and most recently served as engineering program manager. He will be responsible for all engineering activities.

★ **Dennis J. Woywood** has been appointed division vice president, broadcast video systems, for **RCA Commercial Communications Systems Division**.

Woywood will be responsible for product management and engineering for RCA's line of studio and field color television cameras, video tape recorders and control equipment. He also will provide business guidance to RCA's subsidiary company, Channel Islands, which designs, assembles and tests many RCA broadcast products for the European, African and the Middle Eastern markets.

★ **Warner Amex Satellite Entertainment Company** has announced the promotion of **Thomas C. Dent** from the position of chief engineer, Network Operations Center, to the newly created position of general manager, NOC. He is responsible for both the technical and managerial operations at WASEC's new Smithtown, Long Island, facility.

Previously, Dent was manager of operations and chief engineer at WASEC's uplink in Buffalo, New York. Prior to joining WASEC he worked with Warner Cable Corporation installing their satellite uplink in Buffalo.

★ **Alan F. Culbertson**, president of **Culbertson Communications, Inc.**, a California consulting firm, has been selected chairman of the Institute for Electrical and Electronics Engineers, Inc. (IEEE), Committee on Communications and Information Policy. The IEEE Committee is responsible for supplying technical information to government bodies involved in communications and policy-making. Committee members are chosen for their achievements in the communications and information processing field and, as chairman of the Committee on Communications and Information Policy, Culbertson is given membership on the IEEE's Technical Activities Board.

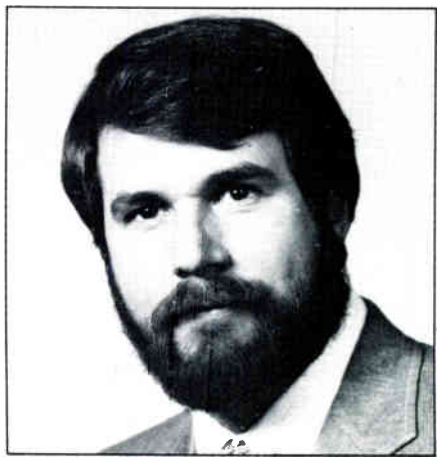
Richard Thayer

★ **Times Fiber Communications, Inc.**, an affiliate of Insilco Corporation, has announced two appointments within the company.

Richard Thayer has joined TFC as director of engineering for the cable television division and **Thomas Hartmann** was appointed manager of electronic manufacturing engineering.

Thayer will have overall engineering responsibility for new product development of CATV coaxial cables. His initial objective is to expand the present engineering department to accelerate product development activities.

Hartmann will be responsible for the development of the Mini-Hub System—a computer controlled fiber optic cable television distribution system designed for use in high-rise apartments and urban areas. He will be charged with economically testing and producing that product.



Edward Muraski

★ **Edward H. Muraski** has been promoted to chief engineer for **United Video, Inc.**

Muraski's responsibilities include the design, construction and implementation of United Video's vast microwave systems. His first project is to organize and promote the Louisiana overbuild with U.S. Telephone and Telegraph from Houston to New Orleans.

★ **George Calcagno** has been appointed manager, CATV application projects, for **Anixter-Pruzan**. Calcagno's background includes sales and application of telephone and CATV products. He has also had experience in cable TV operations.

Calcagno will be responsible for the development and coordination of Anixter's CATV applications group for projects throughout the United States.

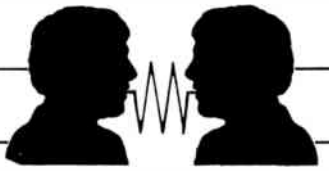
★ **William Warne** has been named director, human resources, construction and technical operations at the Piscataway, New Jersey facility of **Warner Amex Cable Communications**.

★ **Peter M. O'Connell** has joined **Magnavox CATV Systems, Inc.** as technical services training representative.

O'Connell's appointment will provide additional training support for the operation of Magnavox CATV's Mobile Training Center.

Prior to his appointment, O'Connell served in various electronics teaching/training capacities and as a sales engineer for an upstate New York electronics firm.

Tech to Tech



Cable Expansion And Construction

Submitted by Rex Porter, Vice President and General Manager, Capscan Cable Company.

Basic Problem: Aluminum cable will expand or contract .96 inches over a 100 foot span within a temperature swing of 60 degrees. What are the best ways of dealing with temperature induced movement of strand-mounted coaxial cable?

Question: What is the best loop to use to aid the cable in its expansion and contraction?
Answer: We believe a "swag loop" is the best loop and tests run extensively both in the lab and in the field back up our position. While the flat-bottom loop is a better loop than the old standard round-bottom loops, we find that there is a tendency in using the flat-bottom loop to form four distinct corners which tend to weaken much faster than the swag-loop and may break over the life of the cable. A swag-loop is one in which the cable moves away from the strand at an even movement and back into the strand at the same rate. Its dimensions are approximately 36" wide and 6" deep. We have found that this loop will protect all sizes of cable, even in the same bundle.

Question: How often should I have expansion loops in my system?
Answer: We recommend a swag-loop at every pole.

Question: Doesn't that use a lot of extra cable?
Answer: A loop uses approximately 2.2" of cable, a small cost to provide protection against future problems that are sure to occur.

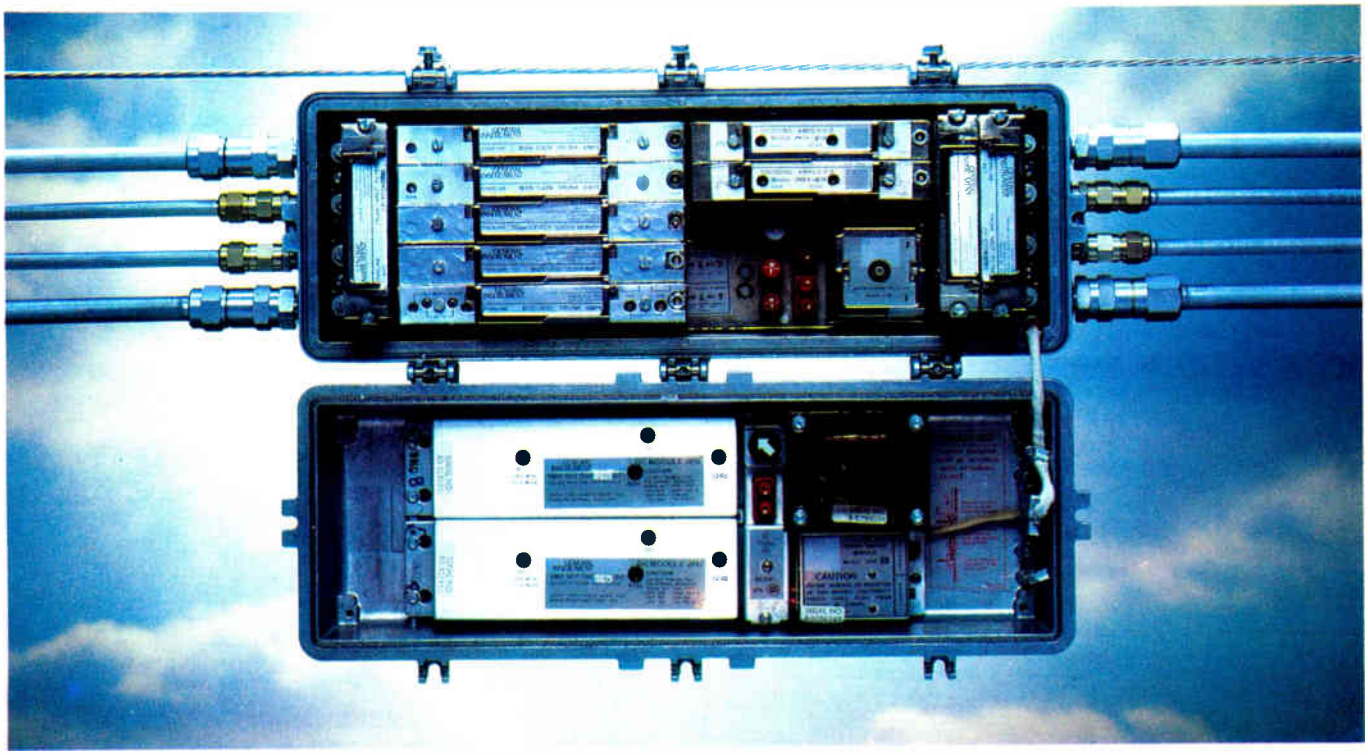
Question: If the aluminum sheath is locked down to the connector and cannot move, how can the dielectric and conductor move out of the connector?
Answer: Remember that the aluminum sheath is a metal with a temperature coefficient different than the steel strand and, more importantly to this question, different from the dielectric material or the center conductor. The polyethylene dielectric is a thermoplastic which will expand and contract with an exact given force. The copper-clad aluminum conductor has a totally different rate of expansion and contraction from either the aluminum sheath or the dielectric. All of these forces are at constant battle with each other. A connector properly locked onto the aluminum sheath may not be sufficiently tightened down upon the conductor.

Question: Speaking of temperature, is it okay to apply heat to the cable's center conductor for cleaning off the poly residue?
Answer: Definitely not! Heat applied to the center conductor will be conveyed deep into the core, loosening the adhesion. High and prolonged heat can duplicate some of the same results as corrosion and can change the effectiveness of the copper-clad conductor.

Question: Some suppliers have shown us a rather novel idea whereby heating the end of the aluminum sheath allows the connectors to be installed without coring. Is this okay?
Answer: While this is a "cute" idea, tests have shown that heating the outside or the aluminum sheath causes some layer of polyethylene to bond to the inside of the sheath. When the steel sleeve is shoved up under the aluminum sheath, it makes contact, not metal to metal as is proper, but makes contact with the layer of polyethylene on the inside of the sheath, reducing drastically the radiation shielding efficiency of the connector assembly. The only heat which should be applied to aluminum cables is the heat required to shrink protective tubing over the connectors and even this should be done carefully to ensure that the dielectric is not affected.

Tech-to-Tech is a new department in ***CED****. Every month* ***CED*** *will present new ideas, helpful hints, or solutions to common technical problems in operating CATV systems. Ideas selected for publication will be awarded $25 for the engineer or technician who developed it. Submissions should be sent to Editor* ***CED*** *Magazine, Titsch Publishing Inc., 488 Madison Av., Fifth Floor, New York, NY 10022.*

Jerrold Starline® 450. The only amplifier with field-proven reliability for today's advanced systems.



It's the 450 MHz amplifier designed especially for cable systems which plan to offer new two-way services. Home security. Pay-per-view. Shop-at-home. Electronic funds transfer. Others.

Every station can be fitted with redundant amplifiers and power supplies, plus status monitoring and feeder disconnect. They'll minimize service interruptions, help pinpoint problems, and let you schedule repairs during regular hours.

Starline 450's modular design gives you unsurpassed flexibility in a single housing. You can install it as a basic one-way system, a two-way subsplit or a dual cable system with the "B" cable midsplit. You can easily upgrade with plug-in modules later. For dual-cable, Super Trunk applications, it can amplify over 66 channels in each of two directions or over 132 in one direction.

The Starline 450 design has already been proven in thousands of miles of sophisticated cable networks. No other advanced-feature amplifier can make that claim.

Starline 450...It's the smartest buy today.

For information, call 215-674-4800. Or write, Manager, Marketing Communications, General Instrument Corporation, Jerrold Division, 2200 Byberry Road, Hatboro, PA 19040

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MODEL PW-20

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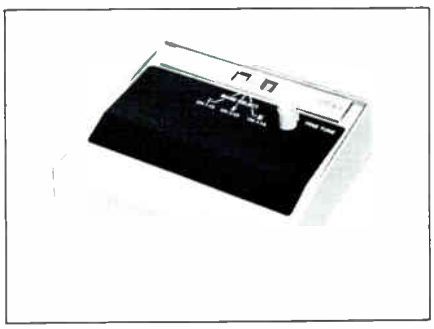
Product News

Type "N" Cable Connector Operates Mode Free to 18 GHz

M/A-COM Omni Spectra, Inc. has announced an improved type N coaxial plug connector featuring mode free performance from dc-18 GHz. Designated part number 3001-7941-00, this 50 ohm connector is for use on RG 402/U (.141 diameter) semi-rigid cable.

VSWR is 1.06 + .006 × f GHz, maximum, from dc to 18 GHz, with maximum insertion loss of 0.21 dB over the same frequency range. The body of part number 3001-7941-00 is passivated stainless steel, with gold plated cable attachment section for ease of solder attachment. Delivery is stock to 6 weeks from factory or distributors. Unit price is $8.13 in quantities of 100 pieces.

For more information contact John Callahan, Omni Spectra, Inc., 21 Continental Blvd., Merrimack, NH 03054, (603) 424-4111.



Vitek 14 channel dual block converter.

Vitek 14 Channel Block Converter

Vitek has introduced a new 14 channel block converter that provides an inexpensive way for cable systems to upgrade to 26 channel capacity. This dual block inverted carrier converter utilizes one block of seven midband channels and another block of seven superband channels.

The unit features fine tuning control, totally shielded R.F. module and a power supply regulator I.C.

The model TC-2 is available immediately, measures only 2 × 7 × 6 inches, weighs less than two lbs., and is priced from $20 to $25 depending upon quantity.

For more information contact Vitek Electronics, Four Gladys Court, Edison, NJ 08817; (201) 287-3200.

Chance Publishes New CATV Product Catalog

A new CATV products catalog published by **A. B. Chance Company** includes nearly 150 products used in the construction and maintenance of cable television systems. Listings range from sophisticated cable-stringing and earth-anchoring devices to basic line hardware such as through bolts and suspension clamps.

The Chance CATV line includes products developed specifically for cable systems. The 20-page catalog is available free from A. B. Chance Company, 210 North Allen St., Centralia, MO 65240.

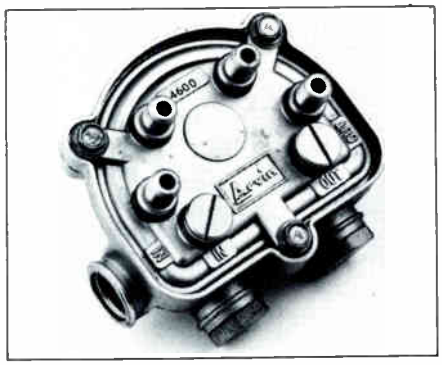
GTC Introduces Unique Cable Burial Techniques Brochure

A detailed, four-color, 12 page handbook designed to highlight **Geauga Trenching Corporation's** advanced cable burial systems, is available from the company. The booklet explains in photographs and text the techniques that enable GTC to bury over a mile a day of reliable, on-line cable systems at competitive prices.

To receive a copy of this information booklet, write to: GTC, P.O. Box 2755, Huntington Station, NY 11746; (516) 462-9810.

New Multi View Catalog Covers CATV Product Line

A new master catalog is now available which covers the complete CATV product line produced by The Multi View Division of **Multi Products International**. Constructed as a hard covered 3-ring binder, the catalog provides a convenient means of storing the firm's data sheets and product updates. To obtain a catalog, send a request on company letterhead to: Multi Products International, P.O. Box 238, Cedar Grove, NJ 07009; (201) 239-8183.



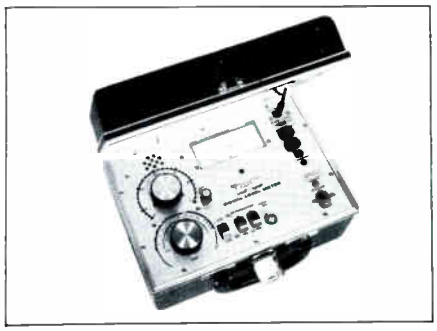
Arvin series 4600 directional tap

Arvin Announces New Tap

Arvin/Diamond has announced the availability of a new directional tap. The new tap, Series 4600, features 5MHz to 400MHz bandpass circuitry in a corrosion resistant zinc alloy case. Also, for the severest environments, the Arvin/Diamond Series 4600 tap is available with an epoxy-based urethane paint finish.

Other features include modular construction for easy maintenance, a center seizure mechanism for conventional and modern cable and new ferrite core materials that have permitted a design meeting specifications much more accurately than early 400MHz taps.

For more information contact: Arvin/Diamond, P.O. Box 200, Lancaster, Ohio 43130; (614) 756-9222.



Blonder-Tongue field strength meter.

New UHF/VHF Field Strength Meter Offered By Blonder-Tongue

Blonder-Tongue Laboratories, Inc. is offering a new, solid-state UHF/VHF field strength meter for professional installers and technicians. Designated FSM-8, the meter operates on any of three different battery combinations. The battery pack is located in the cover and batteries can be changed without removing the meter.

The FSM-8 reads directly in dBmV and has a digital delay circuit to automatically shut off the meter at a preset interval. The lightweight (7 lb.) portable FSM-8 is housed in an impact resistant case with heavy duty shoulder strap and hanging loop.

For more information contact: Blonder-Tongue Laboratories at (201) 679-4000, ext. 349.

Reef Industries Introduces Banner Guard

Reef Industries has added a new product to its accident prevention system: Banner Guard fluorescent orange barricade tape.

Banner Guard fluorescent is a 1,000-foot long continuous roll of brightly colored plastic. The bright color ensures

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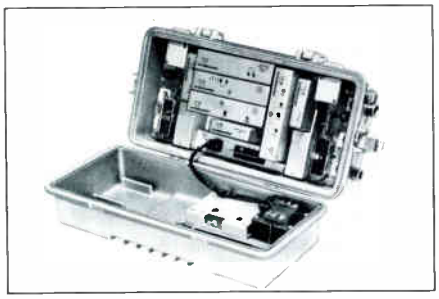
high visibility from long distances. Banner Guard also contains a continuous message such as "CAUTION MEN WORKING OVERHEAD."

Banner Guard is easily tied, stapled, glued or taped around hazards and work areas, and takes the place of bulky barricades or other warning signs.

For more information or free samples call toll free (800) 231-6074 or write Reef Industries, P.O. Box 33248, Houston, TX 77033.



Winegard 400 MHz trunk station.

Winegard Introduces "84" Series 400MHz Trunk Stations

Winegard Company has announced the introduction of the "84" series of 400MHz, sub-split trunk stations.

The "84" series features complete modularity that allows cable operators to buy exactly what is needed. This modularity allows changing, adapting or complete modernization of the cable system.

The modularity also provides for easy servicing. Modules that need repair can be replaced by the field engineer at the site. Another feature is the location for an attenuator pad so signals can be attenuated on short runs of cable.

Construction of the "84" series includes a rugged die-cast housing, and modules that are heat sunk to the finned casting for greater heat dissipation.

Winegard's "84" series allows 54 channels of distribution throughout the cable system.

Winegard's 400MHz equipment is available now to CATV operators. For more information contact: W. E. "Bill" Stone, national sales manager at 1-800-523-2529.

Cable Installation Tools From Lemco

Lemco Tool Corporation has added several new products to their line of cable installation tools. Among those are a nickel-plated carbon steel carpet punch that cuts a 3/8ths inch diameter hole through carpet. The cutting edge rejects the plug then automatically retracts when not in use.

They have also introduced a small cable puller, model J-1234 that is used to pull out single feeder cable prior to lashing. The puller is equipped with a brake that immediately locks on the strand when pull-out pressure on the handline becomes less than the cable tension.

A new trailer designed to carry four reels of cable and constructed of heavy gauge steel tubing has also been introduced. Outstanding features of the unit include a third wheel jack for easier mobility and a mid-arbor support running from front to back for extra strength.

For further information on these and their other products contact: Lemco Tool Corporation, R.D. 2, Box 330A, Cogan Station, Pennsylvania, 11718; (717) 494-0620.

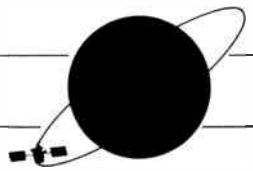
New Anti-Rotation Square Washer From Diamond Products

Diamond Communication Products, Inc. has designed and patented an anti-rotation square washer.

The new design has spiked corners which keep the washers from turning on the pole and a recessed center to capture the bolt head. These two features work together to keep the washers and bolt from rotating while the nut is being tightened. The washers are made of steel and have withstood performance tests at 100 foot-pounds of torque.

Inquiries should be sent to: Diamond Communications Products, Inc., 500 North Avenue, Garwood, NJ 07027; or call Tony DiPace, CATV Sales & Marketing Manager, at (201) 789-1400.

In Orbit



Signal	Day	Start/Stop	Alert Tones	Satellite/ Transponders
ARTS		9:00 p.m./12:00 a.m.		Satcom III-R,#1
ACSN	Weekdays Weekends	6:00 a.m./4:00 p.m. 6:00 a.m./1:00 p.m.	192°/#	Satcom III-R,#16
BET	Fridays	11:00 p.m./2:00 a.m.	018°/#	Satcom III-R,#9
Bravo		8:00 p.m./6:00 a.m.		Comstar D-2, #3H
CableText		24 hrs	None	Satcom III-R,#6 Vertical Blanking
CBN		24 hrs	None	Satcom III-R,#8
CBS Cable		4:30 p.m./4:30 a.m.	524°/#	Westar III, #6
Christian Media Network	Mon.-Sat. Sunday	7:00 p.m.-2:00 a.m. 9:00 p.m.- 2:00 a.m.		Satcom III-R ,#16
Cinemax		24 hrs.	None	Satcom III-R,#20 (E,C) Satcom III-R,#23 (M,P)
CNN		24 hrs	None	Satcom III-R,#14
Cable News Network II		24 hrs.	None	Satcom III-R #15
C-SPAN		9 a.m./1 a.m.		Satcom III-R #19
ESPN		24 hrs.	None	Satcom III-R,#7
Eros	Mon.-Sat. 12 (Fri., Sat.)	12:00 p.m.-5:00 a.m.		Westar III, 7
Escapade		8:00 p.m./6:00 a.m.		Comstar D-2,#4V
Eternal Word Television Network		7:00 p.m./11:00 p.m.		Westar III,#12
GalaVision	Weekdays Weekends:	8:00 p.m./3:00 a.m. 24 hrs		Satcom III-R,#18
HBO		24 hrs	Program 729°/# Scramble 835°/# Duplication 940°/#	Satcom III-R ,#24 (E,C) Satcom III-R ,#22 (M,P)
HTN		8:00 p.m./2:00 a.m.	207°/#	Satcom III-R,#21 (P)

Signal	Day	Start/Stop	Alert Tones	Satellite/ Transponders
Lifestyle		24 hrs.	None	Satcom III-R,#3
The Movie Channel		24 hrs	None	Satcom III-R,#5
Modern Satellite Network	Weekdays Weekends	noon/5:00 p.m. 8:00 a.m./1:00 p.m.	243°/#	Satcom III-R,#22
MTV: Music Television		24 hrs	None	Satcom III-R,#11
National Christian Network		6:00 a.m./8:00 p.m.	073°/#	Comstar D-2,#4V
Nickelodeon		8:00 a.m./9:00 p.m.	311°/# (E,C,M) 519°/# (P)	Satcom III-R,#1
North American Newstime		24 hrs.	None	Satcom III-R,#6
PTL		24 hrs	None	Satcom III-R,#2
Preview Channel	Weekdays	10:00 a.m.-1:30 p.m.	207°/#	Satcom III-R, #21
Private Screenings	Fri.-Sat.	12:00 a.m./3:00 a.m.		Westar III,#7
Reuters	Weekdays:	4:00 a.m./7:00 p.m.	None	Satcom III-R ,#18
SIN		24 hrs	None	Westar III, #8
SPN		24 hrs	None	Westar III, #9
Showtime		24 hrs	None	Satcom III-R ,#12 (E,C) Satcom III-R,#10 (M,P)
Trinity (KTBN)		24 hrs	None	Comstar D-2, #9V
USA Network		24 hrs.	None	Satcom III-R ,#9
WFMT		24 hrs.	None	Satcom III-R,#3 Subcarrier
WGN		24 hrs	None	Satcom III-R,#3
WOR		24 hrs	None	Satcom III-R,#17
WTBS		24 hrs	None	Satcom III-R,#6

Calliope Sundays 7:30 a.m. to 9:30 a.m. The program will not be seen on Thursday April 1, Thursday April 8, or Friday, April 9.

The English Channel. Saturdays and Sundays 12 p.m. to 2 p.m.

E=eastern M=mountain
C=central P=pacific

Alert tones listed are for sign-on, sign-off.

All program times are listed for the eastern time zone, unless otherwise noted

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Whether you're adding one pay channel, 15 pay channels, or 15 tiers of service with 120 channels, Eagle's Descrambler can handle it all. Select only what you need. In the future, channels can be added to the headend scrambler with our simple plug-in module. The headend unit integrates with all manufacturer's modulators and processors and is compatible with all Standard/HRC/ICC configurations.

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There are no subscriber controls with Eagle's Descrambler and our unique sync suppression scrambling insures maximum security. In addition, we've developed a tamperproof identification matrix to eliminate concerns about theft of service.

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Addressability? It's coming. Eagle's Descrambler will be ready for addressability when you are . . . and the descrambler will be perfectly compatible with our addressable unit. Across the board, we're working to protect your investments.

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