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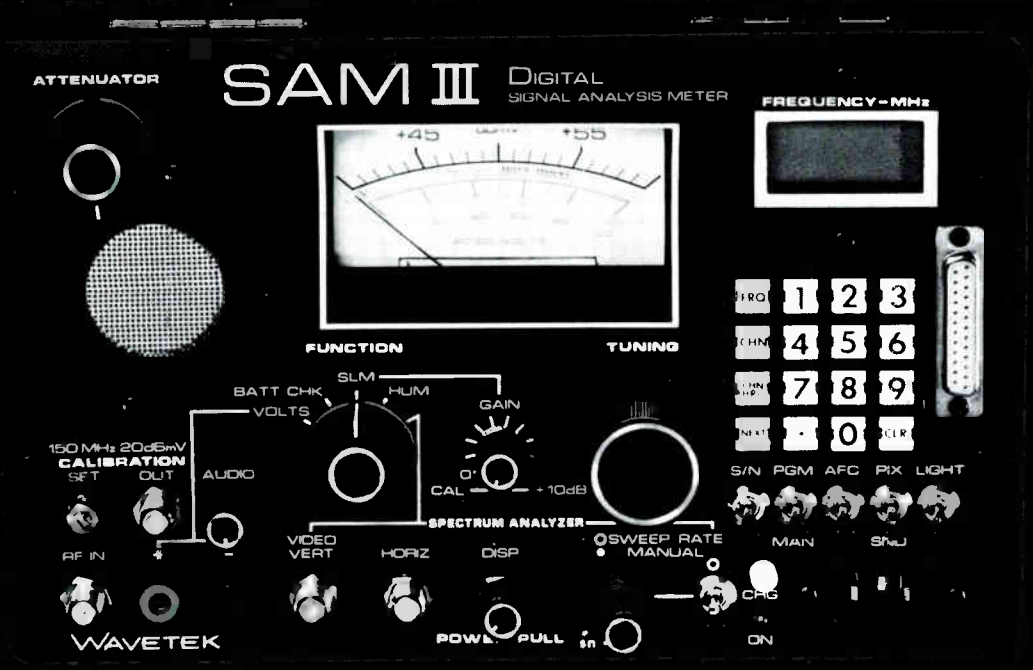

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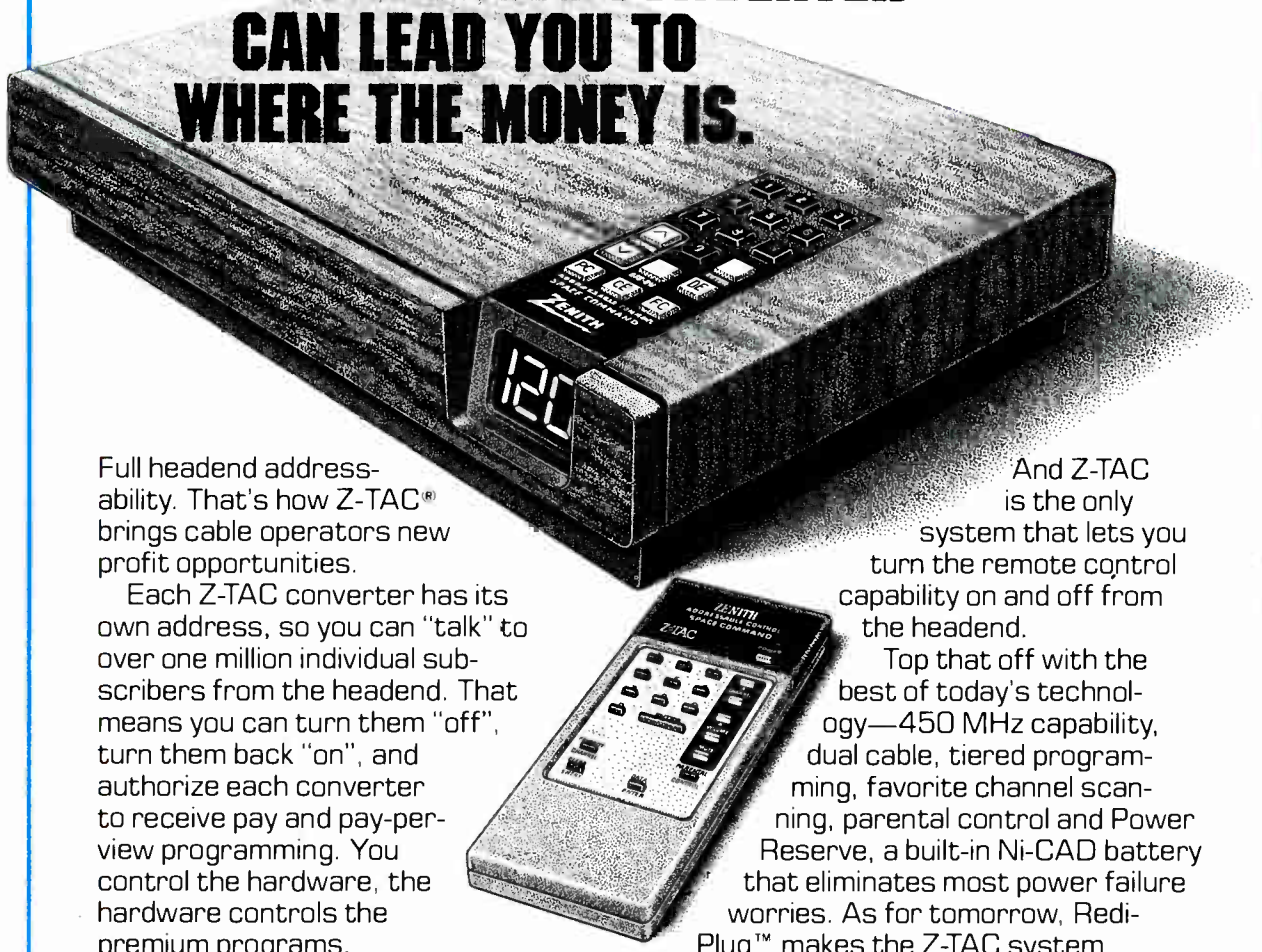

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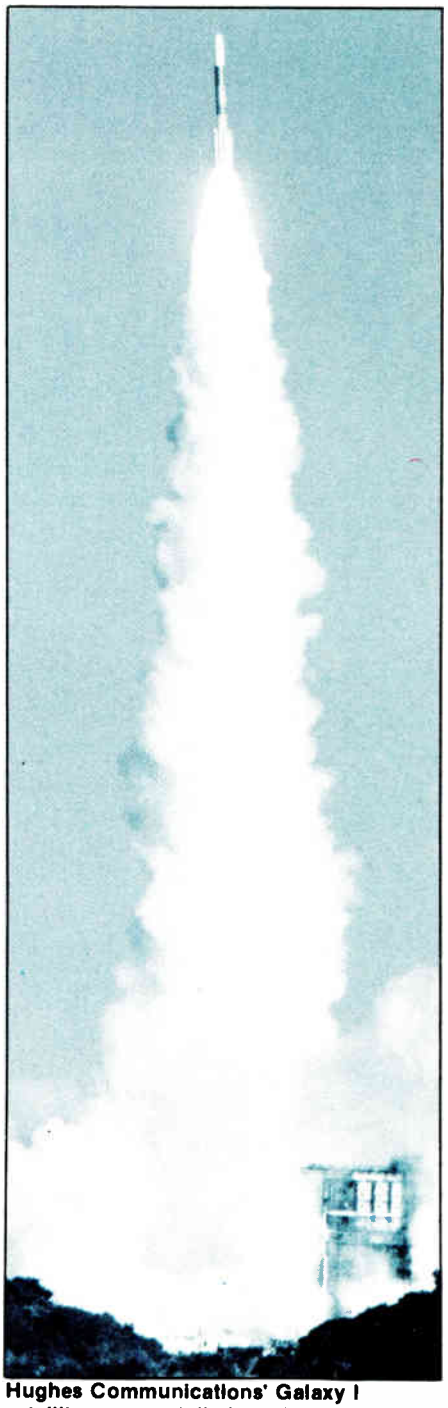
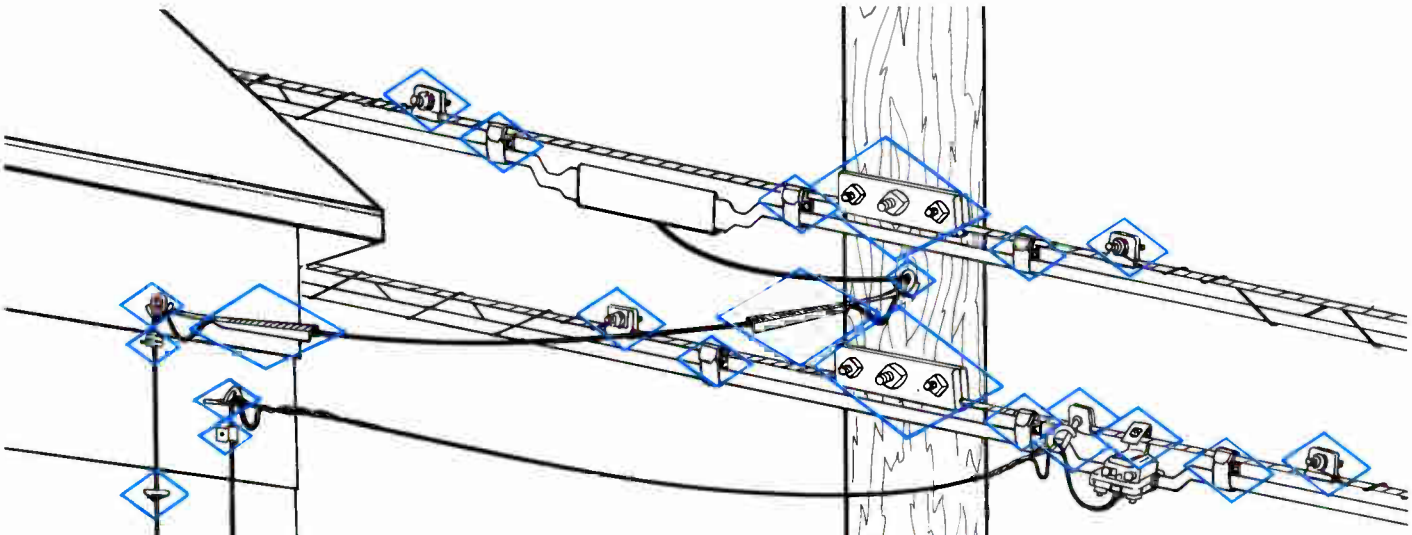


Hughes Communications' Galaxy I satellite, successfully launched last week from Cape Canaveral, will be dedicated solely to cable television traffic. Hughes plans to launch two subsequent satellites, which will be utilized for voice, data and video communications.

CED (USPS 300-510) is published monthly by Titsch Communications, Inc., 2500 Curtis, Suite 200, Denver, Colorado 80205. ©July, 1983, Volume 9, Number 7. Subscription Price: 1 year, $26.00; 2 years, $43.00; 3 years, $63.00. OUTSIDE USA 1 yr. $64.00; 2 yrs. $89.00. MUST BE PREPAID IN US FUNDS ONLY! Second-class postage paid at Denver, CO. *CED* is published on behalf of all parties, including the Society of Cable Television Engineers (SCTE). POSTMASTER: Please send address changes to P.O. Box 5727-TA, Denver, Colorado 80217-5727. BPA membership applied for May 1981.



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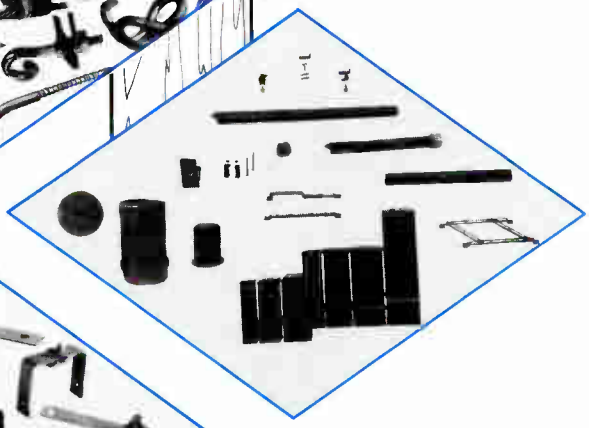

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Techscope

Warner Amex moving ahead with fiber

Warner Amex has initiated a 16-Km repeaterless, long-wavelength fiberoptic link in its Dallas system as the first step toward more pervasive use of fiber in its systems. According to F. Ray McDevitt, Warner Amex senior vice president of technical operations, who described the development at the "Fiber Optics—Now" tech session in Houston, the link is overlashed along an existing cable trunk route to provide supertrunk quality video signals from the Dallas system's East master headend to a hub in the downtown area. Four video channels per fiber are transmitted, using two wavelengths per fiber, with two frequency multiplexed video channels on each wavelength. McDevitt said that, assuming all goes well with this first link, the "spoke" trunk interconnect, the system's primary trunk network in the "hub-spoke-rim" configured system, will be fiber owing to the "potential for very long repeater spacings, vastly greater reliability due to the reduction or elimination of amplifiers, reduced cable size and superior signal quality with no susceptability to external radio frequency interference."

Baseband from Oak?

The industry's growing acceptance of baseband addressable systems appears to be drawing Oak Communications toward introduction of a baseband converter. Although the company is mum on developments, industry sources say the firm that was the first to offer an RF addressable box to the industry has been hard at work designing baseband product as part of its effort to regain momentum lost with unacceptably high failure rates in the early production runs of the TC-56. Oak President C.B. Radloff, appearing at a press conference at the NCTA Convention in Houston, assured operators that "quality is at record levels" now, and added: "Our failure rates in many instances are less than one percent."

Comsat, USCI eyeing merger

Reports have been circulating that Comsat and United Satellite Communications Inc. are discussing a merger of their planned DBS operations; to date, neither company would confirm or deny the speculation. Although Comsat was said to be looking at the possibility of partnership with other firms as well, USCI was thought to be the most appealing prospect, insofar as the company will be first out of the DBS starting gate with launch of services via Canada's Anik C2 this fall. Telesat officials report Anik C2 was successfully launched from the Space Shuttle orbiter Challenger on June 18 and was expected to be "on station" at the proper orbital position by month's end.

A "Bell Labs" for the cable industry?

Raychem Corp., manufacturer of the ThermoCrimp heat-shrinkable CATV coaxial connector introduced at the NCTA show in Houston, contemplates opening its Menlo Park, Calif., environmental and structural testing facilities to the cable industry, according to Raychem CATV Manager Lynn Chapman. Chapman, noting that the telephone industry has Bell Labs and other facilities for testing product quality prior to full-scale installation of new equipment, said preparation of test reports and objectively established specifications would go a long way toward helping MSOs to cope with the diversity and complexity in CATV products. Raychem's labs, which are used for testing the firm's high-tech polymar products for the aerospace and other industries, can measure mechanical performance, thermal aging, bending load, uV degradation and a variety of other factors associated with cable equipment performance. Several engineering vice presidents from major MSOs already have visited the Raychem facilities and told the firm they would be happy to take advantage of the offer.

C-COR acquiring CableBus

C-COR Electronics has agreed in principle to acquire all stock in CableBus Labs Inc., the data communications and CATV security equipment engineering firm based in Oregon. Financial terms of the acquisition were not disclosed. The purchase will involve an exchange of stock between CableBus President Clifford Schrock and Pacific Telecom, majority stock owner of CableBus. Schrock, who said the exchange is taking place this month, will get an incentive payout from the deal, dependent on the sale of new data products developed by CableBus, which will be renamed C-COR labs.

Utilities seen as cable threat

A recently released study on "Fiber Optic Markets" from International Resource Development argues it is likely that utility companies will begin stringing fiberoptic cable along their power lines in the next three to four years, giving them the opportunity to offer telephone, cable television, power and other services on a single wire into the home. According to the theory, a utility would lease information-carrying capacity to other companies, making both cable and local phone plant obsolete by the end of the century. IRD sees the utilities' ownership of the poles as a key economic advantage over cable companies.

Speculating on cable theft

Perhaps the highest figure cited by an authoritative source to date concerning the volume of service theft in CATV was posted by Pioneer Communications' general manager of sales, Tom Calabro, at a press briefing in Houston last month. Noting that the company has had extensive experience monitoring theft from its own boxes, especially in the early years with Qube, as well as in its contacts with cable operators throughout the industry, Calabro said that it appears 24 percent of services viewed are stolen and that a full 90 percent of theft is the result of either infiltrating terminals with compatible scrambling or tampering with the converter box itself. Calabro raised the point in the context of asserting that Pioneer's steel-encased housing for its converters is an important asset for operators to consider when looking at the manufacturer's products. Although many people in the industry would argue with Pioneer's 24 percent theft figure, there was no doubt at the NCTA Convention that the problem has moved to the top of the list in operators' efforts to improve on the bottom line, especially in urban markets. Lawrence DeGeorge, chairman of Times Fiber, made a wry reference to what the current theft level means to the industry in his comments to the press regarding the new Times Fiber/TOCOM joint venture (see page 20) offering operators a combination switched network
system design and security. Noting that the industry keeps talking about moving penetration in already wired franchises up another ten points, DeGeorge stated, "We're already at 65 percent penetration. The problem is that last ten points is going out for free."

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Seminars

July

5-8: Video production techniques will be examined in a series of workshops sponsored by the **North American Television Institute** at the Chicago Marriott O'Hare. Contact (800) 431-1880; in New York, (914) 328-9157.
11-15: A **Community Antenna Television Association** advanced technical training seminar co-sponsored by the **Southern Cable Television Association** will be held at the Massad House Hotel in Richmond, Va. Contact (305) 562-7847.
13: A meeting of the **Chicago Cable Club**, with Ted Turner as guest speaker, will be held at the Hyatt Regency in Chicago. Contact Claudie Swakow, (312) 296-0272.
13-15: Magnavox CATV Systems will conduct a field training seminar with its Mobile Training Center in Minneapolis. Contact Laurie Venditti, (800) 448-5171; in New York, (800) 522-7464.
14-15: A cable television seminar sponsored by **Global Village** will be held in New York City. Contact Robert Aaronson, (212) 966-7526.
15-16: The **Rocky Mountain Chapter of Women In Cable** will sponsor a personal computer seminar in Denver. Contact Margy McKenna, (303) 740-9700.
18-20: Magnavox CATV Systems will conduct a field training seminar with its Mobile Training Center in Minneapolis. Contact Laurie Venditti, (800) 448-5171; in New York, (800) 522-7464.
19: A meeting of the **Southern California Cable Association** will be held at the Proud Bird Restaurant in Los Angeles. Contact (213) 653-6187.
19-20: The **Public Service Satellite Consortium** will conduct a workshop in San Francisco on "How To Video-Teleconference Successfully." Contact (202) 331-1154.
21-23: The annual meeting of the **Montana Cable Television Association** will be held at the Outlaw Inn, Kalispell. Contact Tom Glendenning, (406) 586-1837.
22-23: The **Rocky Mountain Chapter of Women In Cable** will sponsor a personal computer seminar in Denver. Contact Margy McKenna, (303) 740-9700.

August

1-3: A **Community Antenna Television Association** basic technical training seminar co-sponsored by the **Southern Cable Television Association** will be held at the Country Squire Inn, Lake Worth, Fla. Contact (305) 562-7847.
2-3: A seminar on "Communications Strategy in the Year 1 A.D. (after Divestiture)" sponsored by the **Yankee Group** will be held in San Francisco. Contact (617) 542-0100.
10-12: Magnavox CATV Systems will hold a field training seminar with its Mobile Training Center in Columbus, Ohio. Contact Laurie Venditti, (800) 448-5171; in New York, (800) 522-7464.
11-12: An office managers seminar sponsored by **Cable Impact** will be held at the Miramar Sheraton in Santa Monica, Calif. Contact Myra Lieber, (617) 965-6869.
11-14: The annual convention of the **Community Antenna Television Association**, CCOS-83, will be held at the Arlington Hotel in Hot Springs, Ark. Contact (305) 562-7847.
15-17: Magnavox CATV Systems will hold a field training seminar with its Mobile Training Center in Columbus, Ohio. Contact Laurie Venditti, (800) 448-5171; in New York, (800) 522-7464.
17-19: The annual managers meeting of the **Missouri Cable Television Association** will be held at Marriott's Tan-Tar-A resort at the Lake of the Ozarks. Contact Charlie Broomfield, (816) 453-3392.
19-21: An SMATV seminar for existing companies sponsored by **Eagan & Associates** will be held in St. Louis, Mo. Contact Larry Hannon, (904) 237-6106.
29-31: The annual convention of the **New England Cable Television Association** will be held at the Dunfey Hyannis Hotel and Resort in Hyannis, Mass. Contact Gary Cain, (603) 224-3373.

September

7-9: The second annual **Great Lakes Cable TV Expo** will be held at the Indianapolis Convention and Exposition Center. Contact Shirley Watson, (618) 249-6263; or Claude Wells, (312) 693-9800.
8-10: The Eastern Show, the annual convention of the **Southern Cable Television Association**, will be held at the Georgia World Congress Center in Atlanta. Contact (404) 252-2454.
11-14: The International Cable and Satellite Television Exhibition and Conference sponsored by the **Society of Cable Television Engineers,** the **Cable Television Association of Great Britain** and the **Electronic Engineering Association** will be held at the National Exhibition Centre in Birmingham, England. Contact Mark Voss or Mike Loughlin, (713) 463-0502.
12: "The Cable Course," an introduction to the cable industry sponsored by the **Rocky Mountain Chapter of Women In Cable**, will be presented in four two-hour sessions on consecutive Mondays (Sept. 12, 19, 26 and Oct. 3) in Denver. Contact Terry Shoaf, (303) 337-4707.
14-16: Magnavox CATV Systems will hold a field training seminar with its Mobile Training Center in Detroit. Contact Laurie Venditti, (800) 448-5171; in New York, (800) 522-7464.
15-16: The third annual Sports and Cable/Pay TV Conference sponsored by **Sport Management Ltd.** will be held at the Fairmont Hotel in Denver. Contact (303) 793-1123.
20-22: A **Jerrold** technical seminar will be held in Syracuse, N.Y. Contact Diane Bachman, (215) 674-4800.
25-27: The fall convention of the **Kentucky CATV Association** will be held at the Marriott Resort in Lexington. Contact Patsy Judd, (502) 864-5352.
26-28: The annual convention of the **Minnesota Cable Communications Association** will be held at the Radisson South Hotel in Minneapolis. Contact Mike Martin, (612) 861-1166.

Looking ahead

Oct. 18-20: Mid-America Cable TV Association convention, Hilton Plaza Inn, Kansas City, Mo.
Oct. 30-Nov. 2: Joint convention of the Subscription Television Association and the National Association of MDS Service Companies, Century Plaza Hotel, Los Angeles.
Nov. 1-3: Atlantic Cable Show, Convention Hall, Atlantic City, N.J.
Dec. 11-12: NCTA's National Cable Programming Conference, Biltmore Hotel, Los Angeles.
Dec. 13-15: Western Cable Show, Anaheim Convention Center, Anaheim, Calif.
Jan. 18-20: Texas Show, San Antonio Convention Center, San Antonio, Texas.

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NCTA '83: Spinning high tech into gold

Manufacturer responsiveness to operator demands for cost-effective products produces new generation of cable system components

HOUSTON—The NCTA's Cable '83 Convention, lacking some of the glamour of previous conclaves and down somewhat in attendance from last year's record level, nonetheless proved to be a significant event for anyone with an ear to the high-tech ground in CATV.

As the product announcements streaming out of exhibit booths and press rooms and the discussions of basic questions confronting engineers and technicians proved, the industry is facing its test in the real world of major franchise system development with more aplomb and resourcefulness than many observers atuned to franchise hype of the past may have expected.

Manufacturers demonstrated they are listening to the operators, with product developments aimed at increased reliability, more performance for the money and component modularity permitting upgrades as needs and budgets dictate. These developments, particularly with regard to satellite reception equipment, headend gear, coaxial cable, taps and passives, amplifiers, and converters and addressable systems, are spelled out in detail in *CED*'s semi-annual *Tech Review*, beginning on Page 37.

Business lacklustre

Some 15,670 people attended the show, down from last year's record 16,500 in Las Vegas. Exhibitors reported mixed results, with those near the rim of the hub/spoke-designed AstroHall exhibit floor complaining about being out of the traffic flow and many exhibitors generally feeling that floor organization and distance from meeting rooms contributed to lacklustre business.

But there were many exhibitors, particularly those close to the center where the major plenary sessions were held, who said interest in products was high and traffic was good. This was especially true of manufacturers with addressable gear to show, insofar as much of the past reluctance to buy appeared to be giving way to recognition that the technology has matured and the need has arrived, particularly with respect to theft.

Some of the larger equipment orders announced at the show included a two-year, $16-million purchase agreement between Scientific-Atlanta and Cox Cable calling for use of S-A satellite, distribution and subscriber gear in several Cox systems around the country; another S-A deal, this one calling for $12 million in purchases from Falcon Communications; a major purchase for an undisclosed amount involving Group W and C-COR, which will assist with system design as well as provide hardware in Minneapolis suburban and Portsmouth, Ohio systems; the naming of Cable TV Supply Co. as principal supplier of construction hardware

continued on page 15

NCTA honors engineers

HOUSTON—Andrew Inglis, Victor Tarbutton and James Chiddix won the industry's top engineering honors during closing ceremonies at the NCTA Convention here June 15.

Inglis, vice chairman of RCA American Communications, Inc., was presented the Robert H. Beisswenger Memorial Award, which was established to recognize outstanding contributions by either industry programmers or equipment suppliers.

The Engineering Award for Outstanding Achievement in Development went to Tarbutton, who is vice president for Century III Electronics International, and the Engineering Award for Outstanding Achievement in Operations was given to Chiddix, vice president of engineering for ATC's Oceanic Cablevision in Honolulu.

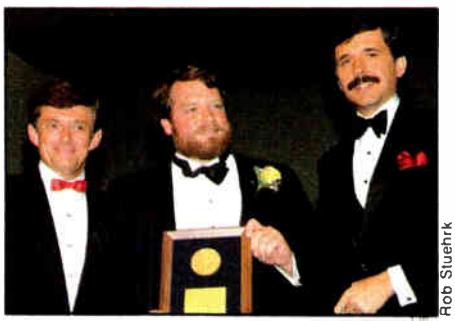
Inglis was recognized for his pioneering work in the development of cable television communications satellites, which occupied much of his business life throughout the 1970s. The NCTA noted that Inglis first visualized the potential of a cable satellite in the early '60s. He went on to convince his management of the necessity of investing in the research and development of the medium and ultimately was instrumental in its launch.

The association, noting that the Engineering Award for Outstanding Achievement in Development goes to someone who has been instrumental in technological and engineering advances essential to the industry, said of Tarbutton's contribution: "This award pays special tribute to an engineer whose skill and creativity have opened new doors and crossed new thresholds to the lasting benefit of the industry. This year's recip-

continued on page 24

Rob Stuehrk

Andrew Inglis, vice chairman, RCA American Communications, receives Robert H. Beisswenger Memorial Award.

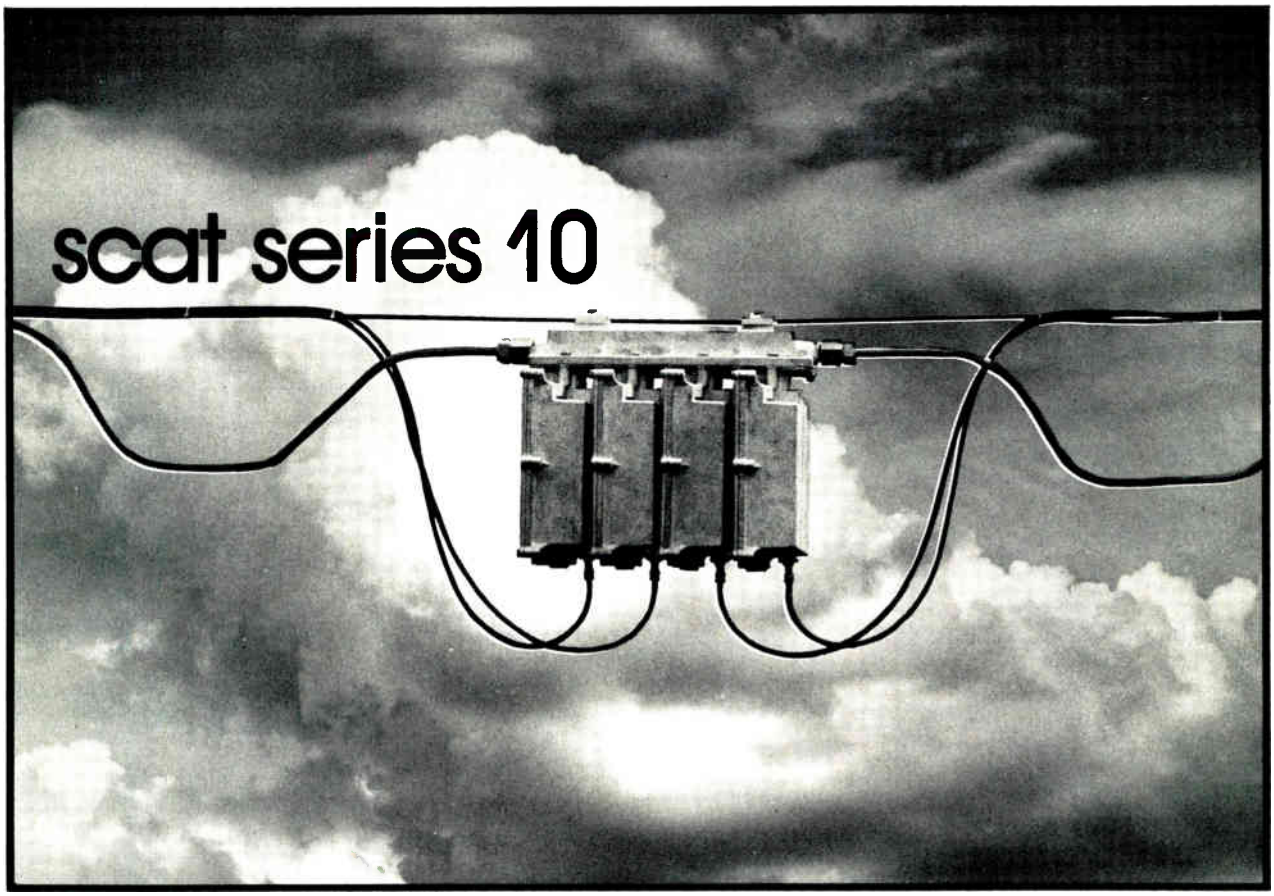


Rob Stuehrk

James Chiddix, vice president of engineering, ATC Oceanic Cablevision.

Rob Stuehrk

Victor Tarbutton, vice president Century III Electronics International.



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continued from page 13

for Tribune/United of Oakland County, Mich.; a $2.6-million purchase of TOCOM 55 Plus addressable gear by Storer as the next installment in ongoing orders for the Anaheim, Calif. system; several multi-million dollar purchases of Times Fiber Mini-Hub systems from Storer and other MSOs; and a Jerrold Starcom Addressable Pay System purchased by Rollins Cablevision for its Wilmington, Del. franchise, which rounded out $25 million in first-year orders for the Starcom system.

New potpourri

The hardware advances unveiled in Houston were as practical and abundant as any yet seen at a cable convention. As a result of developments announced in conjunction with the show, operators can now build systems with up to 160-channel capacity, install amplifiers that put out twice as much power for the number of units, choose from an addressable potpourri that should soon be giving signal thieves nightmares, deliver much cleaner signals and begin right now to market a wide variety of data services to the home and business at reasonable costs to provider and customer.

There are now new ways to connect and protect coaxial cable, to configure systems, to tie billing to addressability, to monitor and maintain system performance and to achieve virtually every other facet of hardware-related operations in ways that expand potential and lower costs.

With respect to cable connection, one of the more unusual developments involves the new technology introduced by Raychem Corp. under the name "Thermo-Crimp." The product, which will be stocked by Anixter Communications outlets throughout the U.S. and Canada, employs heat application on a high-recovery-force, heat-shrinkable compression ring against a corrosion resistant aluminum connector body in lieu of the conventional connector installation that requires adjustment and tightening of coupling nuts. When heat is applied to the device, a special temperature-indicating paint on the installation changes color to show the connection has been made properly.

Rob Stuehrk

The issues surrounding addressability got a full airing at the NCTA "breakout" session on the subject. Panel participants are Jack Frazee, Centel; Robert Hosfeldt, Gill Cable; Rodney Weary, WW Communications; Scott Kurnit, Warner Amex Cable; Barry Marshall, TCI, and Steve Rosenberg, Paul Kagan Associates.

Among the other developments bringing new technological approaches to the cable operations environment at this convention was General Electric's Comband bandwidth compression process, which was demonstrated at the firm's booth. The process, which GE says will be available to the cable industry in 1984, has been refined with a time division multiplexing process that offers improved performance and greater versatility of bandwidth compressed standard NTSC signals.

The firm believes the ability of the system to compress two video channels into one 6 MHz output will permit cable operators to upgrade systems to higher channel capacities at lower costs than would be entailed in adding new plant. GE said it will market addressable one-way and two-way converters, priced at approximately $250 per unit, to work with the compressor, which will run about

Rob Stuehrk

John Pavlic, C-COR Electronics, addresses NCTA technical session on utilization of feedforward technology. Appearing with Pavlic were Victor Tarbutton, Century III Electronics, who served as moderator; Donald Dworkin, New York Times Cable TV; George Luettgenau, TWR Semiconductors, and Dan Pike, Prime Cable Corporation.

$221,600 for a system serving 23,500 subscribers. In such a system, the firm estimates the savings over conventional rebuild for an upgrade from 32 to 38 channels would come to $185 per subscriber, while the savings in a move to 52 channels, using feedforward and Comband in a 78,000-subscriber system, would come to $48 per subscriber.

Sony was another firm showing off new technology that promises to enhance perceived value in television programming. The company's high definition television display caught a lot of attention from operators who had never had a chance to see the difference between conventional and HDTV video.

In fact, the promise of high-tech advances, especially in microprocessing is such that some manufacturers went out of their way at the convention to call attention to the long-term implications in these advances for CATV. Peter Bingham, vice president of engineering at Magnavox CATV Products, speaking at a press conference called to draw attention to these developments, said automated design, component breakthroughs and

Rob Stuehrk

Michael Quelly, E-COM Corp., discusses the relative merits of contention and polling in the data communications session. Appearing with Quelly are Thomas Polis, SCTE; Dr. Geoffrey Gates, Cox Cable, who served as moderator; Heinz Wegener, Wegener Communications, and Michael Dufresne, Videotron Communications.

robotic technology have led to many product achievements in the past year and will produce a spate of new ones in the months to come.

Tech session candor

At the heart of the tech session discussions were the issues that fill the breach between actuality and potential in today's cable operations. The continuing hassle of signal leakage; challenges of reaching more satellites at minimal costs; questions surrounding deployment of outdoor addressability in the war on service theft; the potential of optical communications as an answer to many design problems; the barriers to entering the data communications business; assessments of feedforward cost effectiveness—all were topics that got a full and honest airing at this convention.

Archer Taylor of Malarkey-Taylor Associates, addressing a session on "Today's Cable System Architecture," minced no words in looking at the barriers to data communications inherent in today's cable topology. While separate institutional networks, if they avoid the use of braided cable drops and F-connectors, can provide reliable data services to certain users, Taylor said, such configurations do not "solve the problem of providing enhanced services to cable TV subscribers." Use of the 5-30 MHz subsplit band, he noted, is fraught with difficulties because of the ingress from the many sources, such as marine and aeronautical and fixed mobile comrnunications, that are allocated space in that segment of the spectrum.

Taylor said use of a second cable on the trunk lines, with bridgers switching upstream data from the feeders onto the second trunks, might provide a partial

Correction

We inadvertently gave Scientific-Atlanta a record, of sorts, in the modem department last month by printing a bit-error rate figure of 10^{0} for the firm's Model 6402 Broadband Data Modem. The actual ber for this high-speed modem is 10^{-9}.

solution. "The code-operated bridger switch is a successful technique for disconnecting most sources of noise and interference during the upstream transmission," he said. "However, communication with a particular terminal would only be possible for the brief interval during which the feeder was connected. . . This would be ideal for polling protocols, but would impose an intolerable restriction on other communications."

Taylor warned operators who are interested in going after transactional data business not to be "snowed" by modem manufacturers who "talk about how well their equipment works at 20 dB carrier-to-noise ratio; they are talking about thermal noise, and this is the least of your problems."

"Don't worry about bit error rates, either, " he added. "Practically any equipment will be 10^{-8} ber under ideal conditions."

Instead, he said, the thing to look for in modems is sophisticaled error detection and correction protocols, permitting the frequency to be shifted automatically when there is an interfering carrier at a particular transmission frequency. These and other questions are important to ask, Taylor said, but the operator is not likely to get encouraging answers, insofar as such equipment has a number of drawbacks, including its high cost.

Another alternative to operators, Taylor said, is to consider star-switched network designs. "(T)he decisive advantage for interactive message service (in this design approach)," he commented, "is that individual subscriber data channels can be switched at the hub to protected trunk channels. The tree-and-branch network is basically a party-line always open to the noise and ingress picked up by many subscriber service drops." But he added that such configurations would require development of data switching facilities for the off-premises equipment hubs. Such hardware is available in the telephone industry, he noted, and could be "readily adapted to cable distribution in the star configuration."

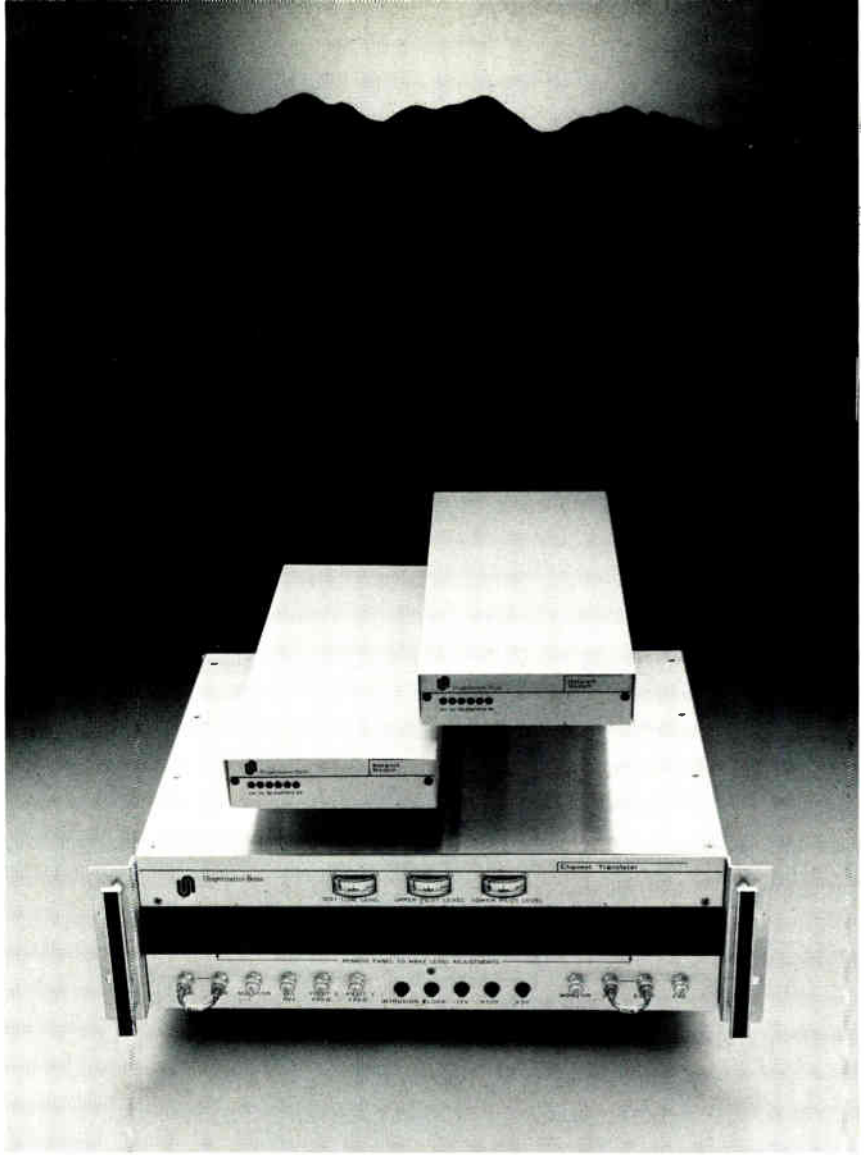
Taylor concluded: "After you have worked night and day for months and spent hundreds of thousands of dollars trying to make your system tight, free from ingress—or reasonably so—I think you will understand what I mean by the "hostile medium." In my opinion, if we intend to offer two-way interactive data services in competition with MCI, Bell, AT&T and others, we simply cannot fool around with ingress at 5-30 MHz. . . We can no longer afford to play with rubber-band airplanes while our competition is building jets."

Feedforward

But if the hard facts are that many problems remain for cable delivery of all the services that have been discussed over the past few years, the progress that has been made toward finding solutions did not go unheeded at this convention. In many respects, on the hardware side, this was a "feedforward" show. Not only did several manufacturers, including Scientific-Atlanta, C-COR and Texscan, announce they are going into production of feedforward gear, but Victor Tarbutton, engineering vice president for Century III Electronics, won the NCTA's Engineering Award for Outstanding Achievement in Development for his pioneering efforts in this field.

Donald Dworkin of NYT Cable TV, Audobon, N.J., presented results of a NYT Cable analysis of feedforward, microwave and other long-distance signal transmission methods at a tech session on feedforward. Noting that supertrunks can be constructed in 450 MHz systems up to 22 miles in length using feedforward amplifiers, Dworkin found that "in all types of systems, feedforward supertrunk costs approximately $500,000 less than microwave, with the difference remaining approximately the same with increasing numbers of hubs."

In addition, he found that feedforward, on a cost and performance basis, compared favorably with both FM video transmission and fiberoptic supertrunk.



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With FM the cost difference for a 44-channel system over a path length of 10 miles was about $440,000, with the FM cost totaled at $560,700, while the cost advantage of feedforward versus fiberoptic for an 11-hub system carrying 35 channels was about $3,200,000.

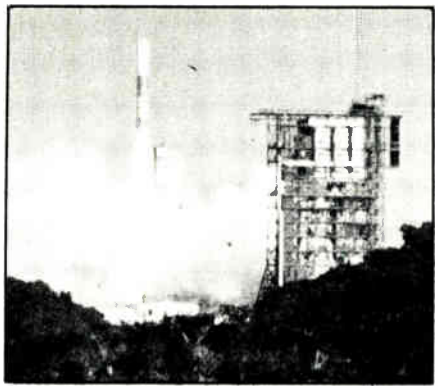
Hughes' Galaxy I soars

Bird is 10th HS 376 satellite built by company but first to be owned and operated

CAPE CANAVERAL, Fla.—Some of the nation's top cable executives from HBO, Turner and SIN were on hand here last week to witness the successful launch of Hughes Communications Galaxy I satellite.

This newest geosynchronous bird, orbiting the earth 22,300 miles above the equator, is the 10th HS 376 satellite to be built by Hughes Aircraft, but the first actually to be owned and operated by the company, through its subsidiary, Hughes Communications Galaxy Inc. Two similar models, Canada's Anik C2 and Indonesia's Polapar B1, were launched two weeks ago from the Space Shuttle. In addition to Hughes' own satellite construction costs, the company paid NASA $30-$35 million for the use of the space agency's Delta 3920-PAM-D launch rocket and other facilities.

Rather than act as a common carrier, Hughes has opted instead for the "shopping center" concept, selling all transponders to program sources. The right mix of programmers will attract both customers and



Hughes' Galaxy I satellite was successfully launched last week from Cape Canaveral.

cable systems to the satellites, Hughes believes.

Galaxy I will orbit the earth at 134 degrees west longitude. With Satcom III-R already operating at 131 degrees, the placement of the new bird will allow operators to receive its transmissions without purchasing a new earth station. Instead, a "dual beam feed modification," developed by Hughes and marketed by several hardware companies, will enable cable systems to receive signals from both satellites with a minimum of cost and signal degradation, Hughes officials claim.

Of the 24 available transponders on Galaxy I, 18 have been sold, with HBO purchasing six, Group W Broadcasting buying four and Times Mirror Satellite Programming, Turner Broadcasting, Viacom International and SIN each owning two.

SIN has announced that it will use its transponders to begin dual feeds of both SIN and GalaVision. Rumors continue to surface that at least some of the other purchasers may be looking toward establishing DBS services. (Galaxy's more powerful transponders enable transmissions to be received with dishes as small as two meters in diameter.)

Just minutes prior to the launch, the mission came in danger of being temporarily scrubbed when a "range safety display" would not function. The display allows ground control to track the path of the rocket, and destroy it if it malfunctions and goes off course, according to a NASA spokesman. The display was fixed just before the two-minute long, second of three available launch windows closed. Galaxy I will become operational after a 30-60 day testing period. *—Eric Taub*

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Times Fiber, TOCOM launch venture

New urban design combines company approaches

HOUSTON—Times Fiber Communications Inc. and TOCOM Inc. have forged a new cable design concept that will employ both companies' products in a joint assault on cost barriers that are undermining the industry's urban commitment.

Times Fiber Chairman Lawrence DeGeorge and TOCOM President Michael Corboy, pointing to difficulties which both of their companies have had in developing the two-way interactive market, unveiled their new venture at a press conference here June 12. The two firms will seek to win industry acceptance of a cable design approach that will use Times Fiber's Mini-Hub fiberoptic switched network distribution system in high-density areas and TOCOM modular addressable gear in conjunction with standard tree configurations in less dense regions of franchise territory.

According to DeGeorge, recent studies commissioned by his firm demonstrate that in areas of density above 100 homes per mile, the switched-network mini-hub approach to two-way service delivery is more cost effective than the standard tree distribution design when such factors as theft of service, life of the product, maintenance and equipment damage are figured into the equation. But in less dense areas, which are typically part of the large urban franchise, the more cost effective approach remains the tree configuration, he said.

DeGeorge indicated Times Fiber talked to most manufacturers of addressable converters in an attempt to find a company whose product and software configurations would meld with those of Times Fiber. TOCOM, he said, turned out to be a nearly "perfect fit" insofar as the firm has had extensive experience with baseband addressability and two-way configuration. "The Times Fiber and TOCOM products complement one another very well—as they may be controlled by the same computer with software enhancements," he said. "For the first time, the cable television industry can economically wire an entire franchise from high-density multiple dwellings to suburban and rural homes—all using compatible equipment." He noted that the patents of both companies cover a full range of coaxial and fiberoptic versions of switched-network and off-premises converter technology.

The two firms will continue marketing their products separately while bidding jointly for the hybrid design approach to new and rebuilt franchises. One of the first systems to be bid on will be Sacramento, Calif., DeGeorge said, once the competing cable firms and the city council come to terms. The United-Tribune Cable joint venture was originally granted authority to negotiate the franchise contract but could not reach agreement with the city on many financial aspects of the deal. Tribune decided to break away from the venture, leaving it to United, which was given a time extension to come up with new arrangements, possibly involving other bidders. DeGeorge said that Sacramento, with densities ranging from 600 households per mile down to 10 or so, is an ideal situation for the combined Times Fiber/TOCOM approach.

Under terms of the joint venture agreement, which is expected to be finalized within 60 days, Times Fiber will purchase a 6 percent minority interest in TOCOM, with an option to purchase another 6 percent at a price slightly below current market rates. In addition, Times Fiber will utilize TOCOM's Mexico plant to expand mini-hub production capacity.

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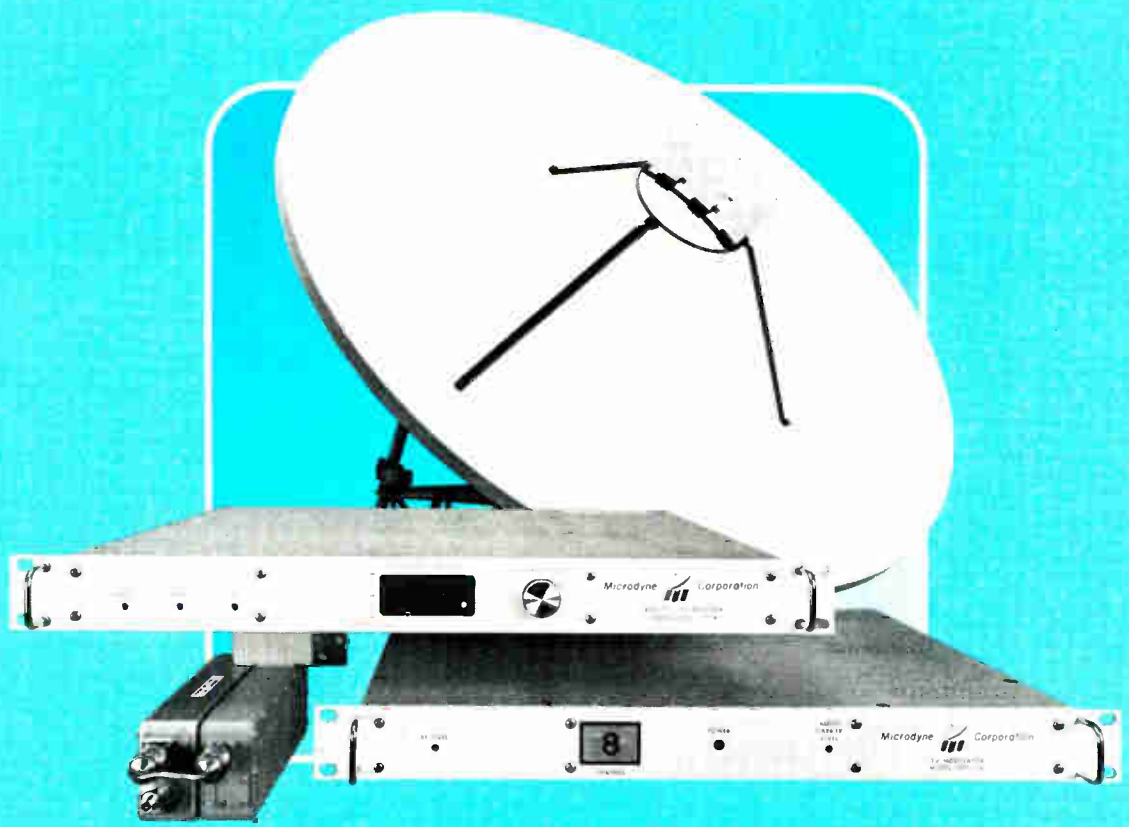

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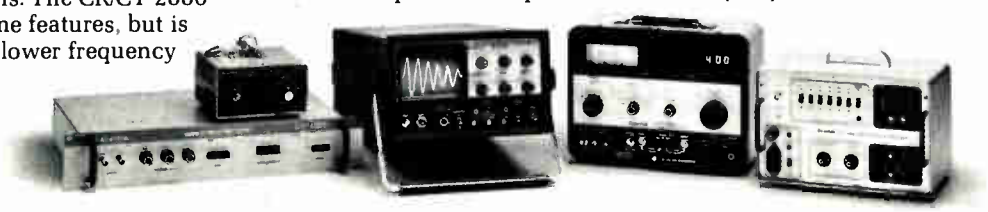


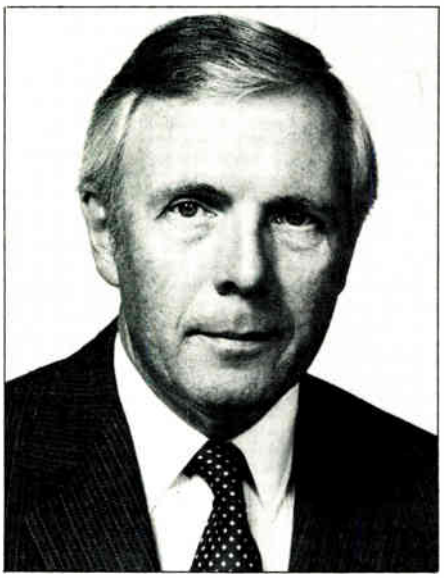
Levergood takes over S-A helm

CATV group exec named president; Topol remains chairman

ATLANTA—Jay Levergood, promoted earlier this year to senior vice presidency of S-A's communications products group, was named June 22 president and chief operating officer of the company. Sidney Topol, president of the company since 1972, will continue as S-A chairman and chief executive officer.

Under the new executive structure, Levergood will handle day-to-day operations of S-A, while Topol will concentrate on long-range planning. Topol, who recommended Levergood's appointment to the board of directors, pointed to the success of S-A's CATV equipment group in announcing Levergood's promotion. "We have named an executive who has been instrumental in building our cable television equipment group into our largest business unit... Mr. Levergood is recognized as an authority on the design and installation of advanced CATV systems and on the equipment needs for the system of the future. We feel this appointment is a necessary and vital step to the continued growth of the company's business and reputation."

The move was not unexpected, Levergood said. "Sid's been president and chairman here for the last five years, and he's considered dividing up those tasks for some time." This is Levergood's second 1983 promotion; he earlier was named senior vice president from vice president, a position he held since 1979. He joined S-A in 1971 as an account manager.



Jay Levergood

Jerrold buys Century III

Lead time in moving into feedforward distribution dramatically reduced

HOUSTON—The Jerrold Division of General Instrument Corp. has dramatically reduced its lead time in moving into feedforward distribution technology with an announcement that GI has agreed in principle to purchase Century III Electronics International.

Century III—the pioneer in development and marketing of feedforward—has just advanced its gear to 500 MHz, while Jerrold has been in the development phase of a feedforward amplifier designed to operate at up to 550 MHz. Feedforward is a design technique that reduces

distortion and improves performance in CATV amplifiers, resulting in greater overall system performance.

According to the announcement, Century III will become part of GI's Jerrold Division and will continue to operate from Century III's West Coast facilities. For the time being, at least, the Century III identity will be retained for that firm's product line.

The terms of the agreement were not disclosed. Consummation of the proposed transaction is subject to approval by the board of directors of GI and the board and stockholders of Century III, execution of a definitive acquisition agreement and other customary conditions. The acquisition is expected to be completed within the next few months.

continued from page 13

ient was instrumental in the development of the first RF power hybrids used in cable, and he is the co-founder of the first Solid State School for cable operators. However, his most important contribution to the cable industry is the development of extended bandwidth feedforward circuits, which have significantly reduced the noise levels in distribution amplifiers so that cascades can be greatly extended. This tremendous development has allowed the cable industry to provide a higher quality of service to the subscriber and has significantly reduced construction costs for the cable industry."

Chiddix, who has been in the cable industry since 1971, was instrumental in the design and construction of Hawaii's first earth station and the design of an addressable system which offers five levels of pay service in the Oceanic system. In nominating Chiddix for the award, ATC Chairman Trygve Myhren and President Joseph Collins also noted that Chiddix "has dedicated personal time and technical expertise to the community" through assisting in establishing television studios and distribution systems for Saint Louis High School and Punahou School in Honolulu and serving as a member of the Advisory Board of Honolulu Community College.

SCTE calls papers

WASHINGTON, D.C.—The Society of Cable Television Engineers has released a call for engineering papers to be presented at its 1984 Spring Engineering Conference, March 5, at The Opryland Hotel, Nashville, Tenn., on the subject of CATV/broadband communications system reliability.

SCTE's Ninth Annual Spring Conference is an intensive one-day technical program scheduled immediately preceding Cable-Tech Expo '84, March 6-8, also at The Opryland Hotel. The SCTE Board of Directors approved a proposal to stage the two events back-to-back at a meeting on June 13 in Houston.

Noncommercial link in K.C.

Police, colleges, libraries and hospitals are connecting with ATC's institutional network

KANSAS CITY, Mo.—ATC's American Cablevision officially launched its institutional network here last week amid signs that what was once thought of as a franchise giveaway could turn out to be a commercially viable operation for the company as well as a worthwhile service to the community.

Although the launch, which was well attended by representatives of the local media and institutional users, focused on the many noncommercial applications of the 72-mile system, at least one user group—the hospitals—was expressing strong interest in employing as yet undedicated segments of the system spectrum for data transmission, according to Chip Sartorius, I-Net director.

Sartorius stressed that American Cablevision is a long way from offering data services commercially but noted that system engineers have begun gaining experience with the data communications

continued on page 35

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Drops and leakage: The Rogers/UA approach to setting standards

By Hugh Bramble

The recent trend toward more channel capacity has increased the shielding required for all components of modern cable systems. And, perhaps even more important to the ingress problem, is the increasing use of the 5- to 30-MHz return systems for pay-per-view, opinion polling and home protection systems.

It is the purpose here to show that leakage amounts can be predicted for many situations and that at least one method exists for measuring shielding in absolute terms. In a saturated system, the drop section will contain more miles of cable, more fittings, more actives and more passives but typically will receive less attention than any other portion. Some of the problems and solutions for the drop system will be discussed.

The "Seed" type test method developed by Belden has been widely used to describe shielding effectiveness for drop cables. This test method may be among the most misunderstood in the industry. The method has never been advertised as anything other than a relative measurement; however, if certain precautions are followed, it can be used to predict actual field performance.

Figure 1 shows the amplitude versus frequency response of a three-foot long bare center conductor installed in a seed device. The deep dips in the received power at 160, 310 and 460 MHz should, according to theory, be caused by both the inability of the .5 or multiple of .5 wavelength stub to absorb power and by its inability to radiate power. When cable is tested, it is properly terminated so that power will be absorbed at all frequencies, but the resonant effect for radiation will remain. Separating these two factors in order to derive a true reference relating power leaked to power received is, at best, very difficult.

To demonstrate that the peaks were usable points for predicting worst case, a series of "Seed" traces were run with incremental changes in the length of the cable under test. Figure 2 shows the results as the same piece was cut from 3 feet progressively to 2, 1, 0.75 and 0.5 feet in length. The peaks were nearly the same value as they changed in frequency, and a good approximation (+/- 1.5 dB) of what would be measured at any frequency between the peaks could be made by simply drawing a straight line from peak to peak. (This straight line approximation does not hold if two peaks are used to predict the next higher or lower frequency peak value.)

We had noted in prior work on several active two-way plants that the 5- to 30-MHz ingress measured in the system when compared with an outside antenna was not predictable from the three-foot "Seed" results. To resolve this problem and to assist in selecting suitable cables for the two-way plants, quasi-seed devices were built with lengths of 20 and 40 feet. The high frequency (75 MHz and up) peaks were in rough (+/-5 dB) agreement with the standard equipment. The field results indicated that the long chamber was predicting the relative merit of shielding down to 5 MHz. Therefore, since the desired goal had been reached, research was stopped. But experience gained in the preparation of this article suggests that several improvements in the 40-foot chamber could substantially improve the correlation.

Identifying inconsistencies

Data gathered over the last several years from numerous transmitter vs. field strength measurements have been converted to the equivalent dipole (CATV leakage) type readings. These figures were then compared with the theoretical field strength as calculated from equations in *Reference Data for Radio Engineers* (see appendix). Transmitters utilized were two TV stations (channels 3 and 8), the local system's 151 MHz radios, a "calibrated leak at 108 MHz and of 20 uV per meter at 10 feet," a 27 MHz CB radio, 80- and 2-meter ham transmitters and several local FM radio stations. A dipole receiving antenna was normally used, as were the standard antennas, if their gains were known. Signal strength measuring devices were either a standard CATV signal level meter or a spectrum analyzer as available.

On numerous tests, very good results (+/- 2 dB from predicted) were obtained, but many did not correlate at all. As the results were off as much as 25 dB, an explanation seemed in order.

The local TV and some of the FM stations behaved normally when measured utilizing the system's tower-mounted antennas but none of them did when measured with the dipole 10 feet off the ground at the tower base. Since the "calibrated leak" existed at this location and it behaved correctly, distance, at first, seemed not to be the cause of the errors. After many false starts, the local system chief engineer suggested Fresnel zones. While these equations are not normally applied to VHF radio, each case that failed to calculate did not have 0.6 Fresnel clearance. The 20 uV leak also ceased to follow predictions at about a 50-foot path length and a 10-foot clearance. This is close to where the ground enters the zone.

Figure 1

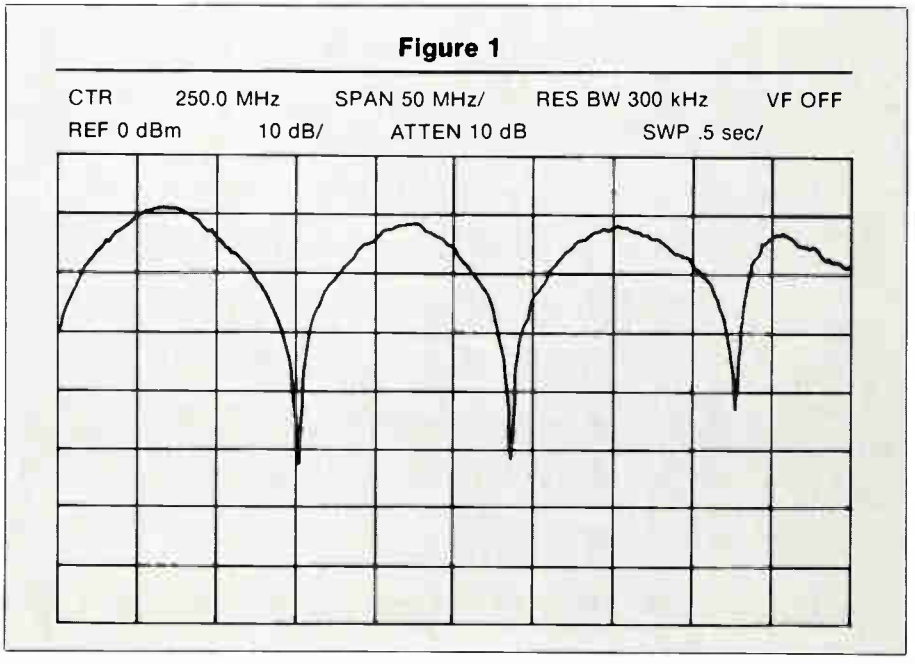
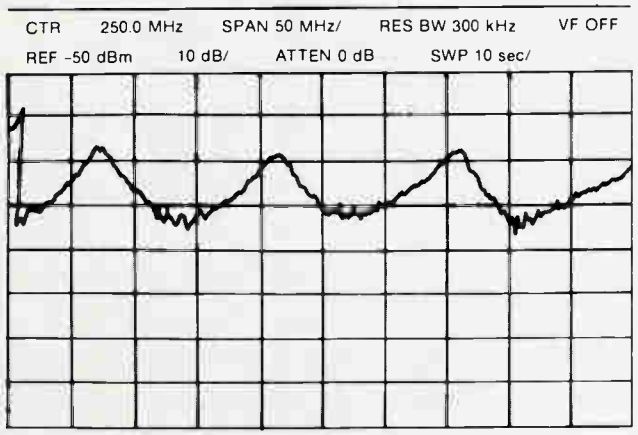
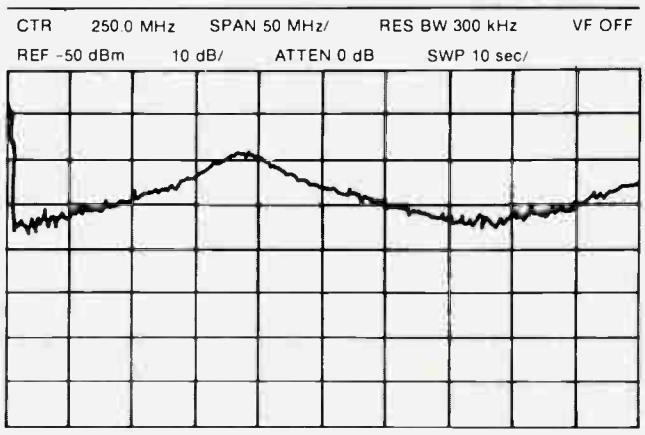


Figure 2

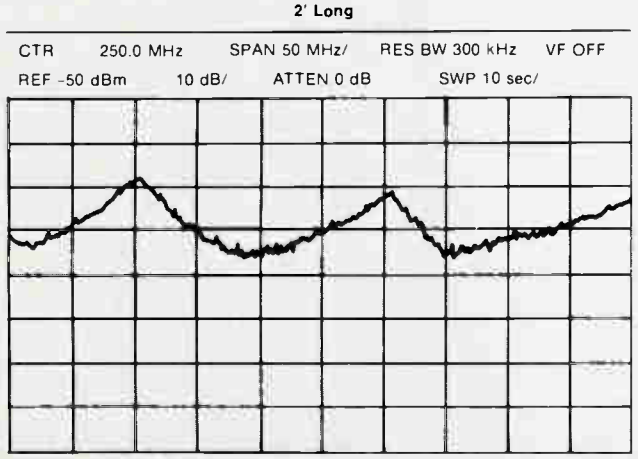
3' Long



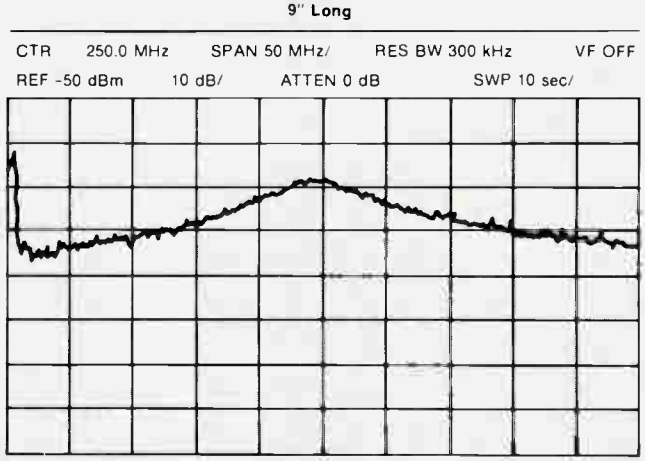
1' Long



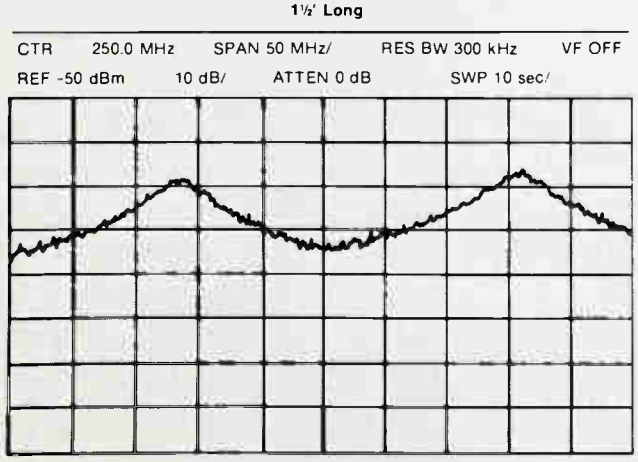
2' Long



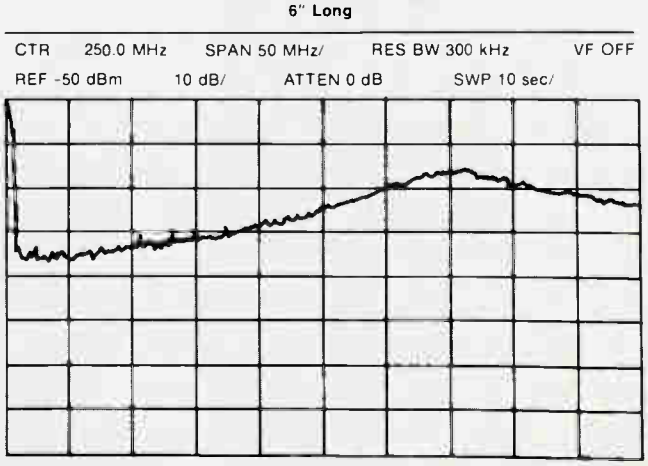
9" Long



1½' Long



6" Long



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In most cases, no matter what the equations predicted the results to be, the dipole readings were never above +50 dBmV and were normally about +40 dBmV.

Based on these limits and the assumption that the peaks shown in the "Seed" measurement would be valid, a test was conducted. A sample of standard RG59u cable was carefully measured in the chamber (Figure 3). This same cable was carried to a location in the system, and a line extender was installed and adjusted to boost applied levels to approximately +50 dBmV. Standard dipole CATV leakage measurements were then performed on channels 2, 4, 5, 6, 9, 10, 11, 12 and 13. Skip and/or local channels 3 and 8 interfered with readings on 2, 4, 9 and 12. The results from the high band channels varied from 3 dB to 1 dB from what would be expected if the "Seed" reading were treated as path attenuation. The low band channels, unfortunately, were 10 dB and 7 dB lower than predicted. Since the 10-foot measurement distance was less than one wavelength and since the bare center conductor seed test results indicated from 8 to 12 dB loss, near field effects might be the problem. A trip back to the calibrated leak with tests run at 5 and 2.5 feet confirmed that within one wavelength the results were always low and were very dependent upon position at a fixed distance.

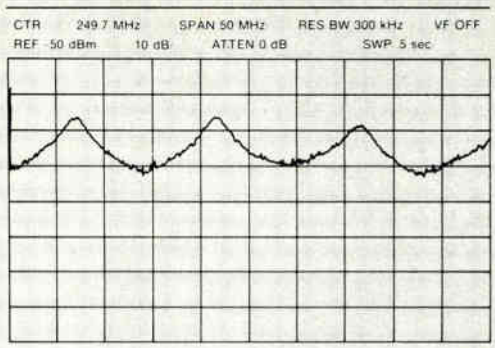
Earlier testing had been done by measuring the level of an off-air signal after entering a long cable. This level was then compared with dipole or long-wire antenna levels close to the cable. These tests also confirmed that the seed type peak measurements could be used. Ingress was never worse than what would be predicted by using the "Seed" (or longer seed device at lower frequencies) as a path attenuation. Again, some of the data were substantially better than would be expected; so, recently, more field testing was done. If the length of the cable was changed to the multiple odd quarter wavelength, the ingress increased to the expected level.

These observations lead the author to believe that a seed-type measurement can be treated as a specification for system performance. Since the length of a drop is somewhat random, actual performance should be somewhat better than predicted.

Setting standards

From known operating levels and the above observations and calculations, the cable engineering community should be able to decide what performance is required. In the following examples reasonable worst case is used. For the CATV operator the most strict requirement will be protecting an analog AM TV signal. Since most services use FM modulation

Figure 3



and transmitter powers around 100 watts, or the base stations are not likely to be near residences, this worst-case distinction for other users has fallen on the Amateur Radio Service. This does not imply that they are the source of a problem; rather, the opposite is true. When the industry elected to start operating, we accepted the responsibility not to cause any other services problems. The bottom line is that we invaded the nest and had better learn to live in it!

For downstream (50 MHz and up) signals not to interfere with other services the following numbers could be used. Tap spigot outputs range from +20 dBmV to +10 dBmV, so an average of +15 dBmV was used. The groups most likely to be interfered with are those who try to work the lowest incoming signals. These are the radio amateur services which use SSB and CW modulation methods and try for the most distant contact. These radios will typically work with 0.1 uV (-80 dBmV) signal levels. At a distance of 10 feet and a driving voltage of +15 dBmV, the equations indicate that drop shielding need only be about 50 to 60 dB so as not to interfere with the amateur radio operator's reception.

To avoid the Ham 2000-watt PEP transmitter's interfering with downstream service requires much greater shielding. At 10 feet with a 12 dB gain antenna, he can produce dipole levels of +105 dBmV. This means that to show no co-channel with a set or converter input of 0 dBmV, the shielding should be 105 dB. Fortunately, most Hams with this type of equipment also build 50-foot or higher towers. Assuming the drop is 10 feet off the ground, the minimum separation would be 40 feet, so "only" 97 dB would be required. Additional help is given by the antenna pattern. The other services have always faced TVI problems and have been able to solve them satisfactorily. This is particularly true of the amateurs who must live with their neighbors. If the industry is not careful and responsive to these problems, we will make him face a problem with no solution.

To avoid a return system signal (5 to 30 MHz) leaking to interfere with a Ham receiver at 7 MHz, the following model is assumed. The highest level used in the CATV system would be a modulator for returning video signals at +60 dBmV, and at 10 feet with no shielding this would produce dipole levels at +65 dBmV, according to the formula. However, 10 feet is less than 0.1 wavelength, so while it is unpredictable, experience indicates a level at least 10 dB or, more likely, 20 dB below this would exist. Using the least optimistic (+55 dBmV) levels still requires shielding to 135 dB for noninterference.

Ensuring that this video signal will not be impaired prior to leaving the single drop is the next problem. The same Ham transmitter powers are allowed in HF as were used above, but antenna gains are lower and the near field confusion still exists. Using 3 dB gain antennas on the transmitter and assuming the worst case (10 dB for near field) implies a dipole reading of +106 dBmV outside the cable. Shielding from the lowest modulator output (+35 dBmV) requires 71 dB. Even if a fully loaded 8-port tap had all drops at the 10-foot distance and the leakage signals were in phase, shielding of 89 dB would suffice.

Drop ingress limits

A more likely source of interference in the return path is caused by the summation of all the drop leaks from everything connected to the return trunk. While this problem can be controlled by using switches so that only a few drops are active at any time, not all systems use this plan. The worst case (largest single trunk area) is probably 200 miles of plant with 10,000 drops connected. The signal sources will usually be distant skip signals with basically uniform distribution over the area. Under all conditions except the most extraordinary, these signals do not exceed 10,000 uV (+20 dBmV dipole). Due to the random path lengths through the cable system to the summation point and the different velocity of propagation in the cable compared to air, the same signal will add with random phase much as noise does. The 10,000 drops will thus increase the ingress 40 dB above a single drop if they are all equal. To maintain the 60 dB carrier-to-ingress, if all drops are operated with the +35 dBmV modulators, the ingress in any drop cannot exceed -65 dBmV. This would be accomplished with shielding of 100 dB.

CATV cables and devices exist (details later) to accomplish shielding to about 110 dB in the drop. From the above discussion, there is only one problem area which has no easy solution at this time. The case of video return, while possible if every drop is done correctly, is uncommon and could not happen from very many places at once (channel capacity per trunk is only 4). Interference could be avoided by changing frequencies or moving the insertion point several spans away from the other service's antenna. A much more likely problem would be transponders for pay-per-view or monitoring activities. These devices usually operate 15 to 20 dB below the visual carrier levels cited in the above example. Even with the 20 dB relaxation, the best equipment that exists when installed with perfect workmanship could still cause interference. It would not be practical to move the transponder away from the customer's home. The only saving grace is that most types of this equipment do not transmit continuously; they are on for only milliseconds at intervals of several seconds to hours, depending on their purpose, and cause very little disturbance to nearby services. This author can find no solution for those systems which transmit continuously and are selected by some other means.

Rogers/UA standards

Rogers/UA Cablesystems, for one, has adopted a standard for all drop materials which meet or exceed 90 dB by seed test. As mentioned earlier, equipment meeting this specification is generally available. The following will outline our experience in finding such material.

Cables which meet the requirement are available from all popular vendors and are usually noted as "Metro" or "high shielding" types. All sizes from 59 to 11 are available from many. The cost penalty for these cables as opposed to lesser shielding on the same size varies from $2.00 to $9.00 per thousand for the 90-105 dB range. The 105 dB+ shields may cost as much as $30.00 per thousand in the RG11 size. This 20- to 90-cent cost per drop to handle the majority of cases does not seem high.

In addition, the chamber tests show that the conventional "F" fitting with separate crimp ring is very bad for shielding. Even the best quad shield cable can achieve only 80 to 90 dB shielding if these fittings are used. The integral crimp fittings were used in all the tests mentioned above and are the only type we will accept. The cost penalty is about $.02 per fitting or about $.15 per drop.

Many of our systems use outdoor traps to secure pay services, but securing these devices with proper shielding has not been a problem, since almost all vendors do not charge extra.

Another item not discussed above but now standard for us is a filtered ground block. This device is not intended to increase shielding but to protect the return path from tampering as well as customer installed devices such as video games and tape recorders and their poorly shielded hookup cables. The cost of this is about $1.00 more than a conventional block. Use of this device also eliminates the filter requirement in the matching transformer, reducing its price by about $0.25. The additional cost per drop is difficult to compute because multiple matching transformers are often required. We use about 1.5 transformers per drop, which costs approximately $0.60 additional. (This figure is probably high because of the savings each time a transformer is replaced.)

The only area of concern is the splitters and passives. While no cost penalties have been required, only one vendor has furnished devices which meet the specification, and no four-way unit is available. The vendors have taken the stand that our business is a small part of the total business, so rather than change, they will make do with the remainder until such time as other operators adopt similar standards.

Most converter manufacturers have already addressed the shielding problem in their 35-and-up channel converters. All of these units tested in our evaluation lab have controlled LO leakage and spurious interference in the band of interest. If a cost penalty exists, it is unknown.

Conclusions

As outlined above, the cost per drop to change to equipment which is capable of two-way and noninterfering operation ranges from $0.95 up. The vast majority of system connections are not next door to a high-power transmitter. Additional benefits from the additional shielding are gained because during the required RFI patroling, illegal hookups will probably be found. Most of the local electronics stores do not have equipment with proper shielding, and most people do not know how to install it properly. It is not uncommon to find these drops leaking around the 5 to 20 uV per meter level. With the cost of a drop including a converter and labor, at $70 and up, the extra 2 percent or less that shielding costs should not deter anyone.

Acknowledgments

The following people at Rogers/UA have gathered data and allowed its use in this report:
Bob Luff, VP Engr.
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Bob Wanderer, Eastern Div., QC
Larry Flaharty, San Antonio, QC
George Neill, Southern Div., QC

The following people have disrupted their workday to assist in the numerous tests and re-tests to verify why certain things did not work as predicted.
Chick Comstock, Chief Engr., Texas Cablevision
Red Foley, Microwave Tech., Texas Cablevision
Hank Henry, QA Tech., Texas Cablevision
Jody Shields, Evaluation Engr., RUAC
Kevin Robins, Evaluation Tech., RUAC
Larry Baker, Evaluation Tech., RUAC

Many thanks to all the above.

Appendix

Equation 1
P(r) = P(t)*G(r)*G(t)*L*L/
<4*pi*R><4*pi*R>, where:
P (r) is the received power in watts,
P (t) is transmitter power in watts,
G (r) is gain of rcvr. antenna above isotropic,
G (t) is gain of xmit antenna above isotropic,
L is the wavelength in meters and
R is the transmission distance in meters.

Equation 2
E(f) = 0.021*E(slm)*F, where:
E (f) is the electric field in uV per meter,
E (slm) is signal level meter reading in dBmV and
F is the frequency in MHz.

Equation 3
P(dB) = 10*log<P(r)/13.3 nW>, where:
P (dB) is the level in dBmV,
P (r) is from EQ.1 and
13.3 nW is the power in nanowatts for 0 dBmV.

Hugh Bramble, director of engineering west, Rogers/UA Cablesystems Inc., began his cable career at ATC's Stillwater, Okla., system shortly after graduating with a B.S.E.E. from Oklahoma State University. From ATC, he went on to become director of operations at Viacom Cablevision, Dayton, Ohio. Bramble joined Rogers/UA Cablesystems in 1978. He currently is responsible for overseeing the engineering of all Rogers/UA cable systems located in the western half of the hemisphere. His major contributions and interests lie in advanced systems design and component specifications for long-life technical performance and cost.

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cont. from p. 24, **KCI-NET**

environment through an experimental link between Quincy Laboratories and the Swoberidge Nursing Home. The two-way hookup permits direct input of patient information from Swoberidge into the Quincy facilities as part of the nursing home's laboratory management system.

According to Sartorius, there are now noncommercial users in all four I-Net categories established by the franchising contract. These groups include the police department, colleges, libraries and the hospitals, with fifty locations in all designated for eventual hookup to the 300 MHz, mid-split system. The hospitals have been on the line the longest, some of them for over a year.

I-Net trunks emanate from the three system hub sites, with users tied directly to the trunks via drop cable. Sartorius noted that the Jérrold JV line of equipment driving the network has performed well. He said the I-Net is an especially "clean" system insofar as there are no feeder lines between trunks and users.

Each user group has been designated a full video channel for such uses as educational programming and local and satellite-linked teleconferencing. The 11 hospitals currently using the network hold conferences twice weekly and participate in national teleconference hookups with the American Hospital Association and the American Hospital Television Network three or four times a month.

Several hospitals have advanced television production facilities, including those at the University of Missouri School of Medicine, where the launch presentation took place. The hospital consortium showed the launch audience tape segments of various programs and teleconferences that they have produced over the past year.

The police department, which intends to use its channel in conjunction with its regional training academy programs, has been gaining experience with television production through use of the system's access studios.

The college group, which includes several institutions with four-year degree programs in telecommunications, intends to use its channel for a variety of purposes, including educational programming, which has already begun, conferencing and delivery of programming produced by students in the telecommunications programs. Sartorius said there has been talk of various colleges sharing instruction in areas of respective specialization, but competition among the schools may hamper that process. He noted that in the past year two major universities have dropped out of the Kansas City Regional Council on Higher Education and more may follow suit. He anticipated the schools eventually will form a body to oversee I-Net operations, but so far no coordinating center has been established.

With only four I-Net channels set aside for institutional use at this time, there is ample spectrum space left for development of commercial services. Right now, Sartorius said, ATC has been giving the system a fairly free rein in the testing and developmental aspects of business communications. Whether or not the system goes forward with full-scale marketing of such services will depend, in part, on the legal environment, he noted. A big unknown is the posture of Southwestern Bell on the issue. But Sartorius indicated that from all appearances the institutional users themselves as well as the business community generally realize they would stand to benefit from the expanded transmission facilities provided by the I-Net. Meanwhile, he said, there is no doubt that the community is interested in the noncommercial aspects of the system and is enthusiastic in pursuing development of services.

The Kansas City cable system, incorporating 1,600 miles of subscriber plant along with the I-Net, is virtually completed, with only a few pockets in outlying districts of the city remaining to be wired. Sartorius said he hopes by the end of next year all the I-Net user locations designated in the franchise agreement will be connected.

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- Coaxial Cable
- Taps and Passives
- Amplifiers
- Converters and Addressable Systems

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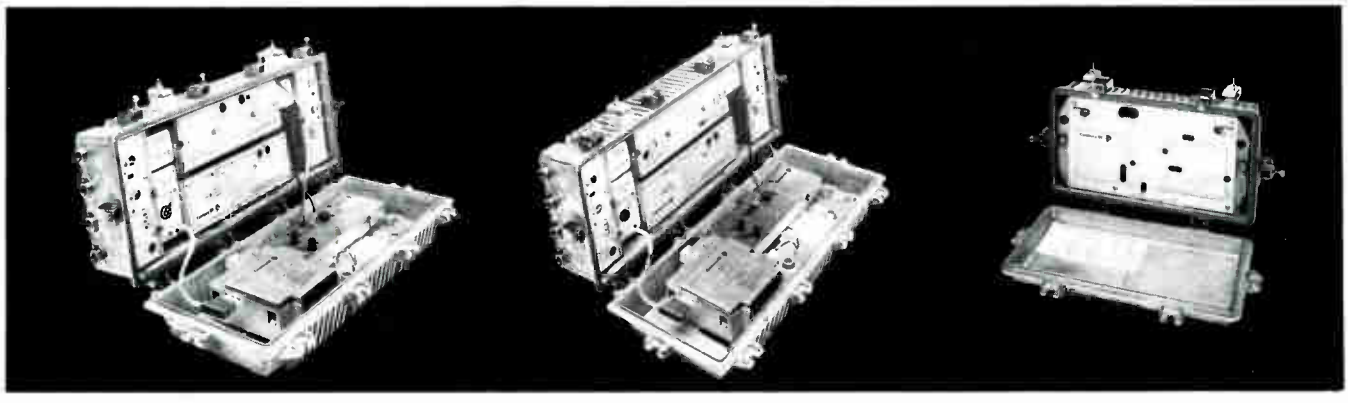

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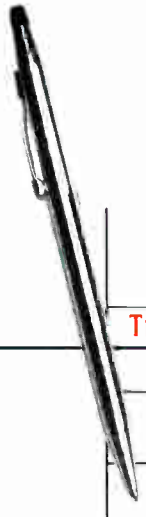

	450 MHz 60 Ch. Loading	Century III Actual System Operating Levels			Other Equipment
	Trunk Spacing	22dB	26dB	30dB	
Trunk	Output Level	+33dBmV	+36dBmV	+40dBmV	
	Composite Triple Beat	−102dB	−96dB	−88dB	
	Cross Modulation	−102dB	−96dB	−88dB	
Bridger	Output Level	+47dBmV	+49dBmV	+49dBmV	
	Composite Triple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

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Tech Review
New Product Developments of 1983

A comprehensive review of advances introduced by manufacturers in six product categories, including satellite reception equipment, headend gear, coaxial cable, taps and passives, amplifiers and converters and addressable systems.

Six months into a year marked by an important shift from the hectic buy-now, think-later pace of cable growth over most of the past five years, it is clear that manufacturers have taken several cues from the increasingly sophisticated buyer in the CATV marketplace.

Perhaps the most important message has centered on operator demands for products that will help them trim immense capital budgets while allowing them to fulfill commitments to provide communities across the land an ever-expanding array of programming and ancillary services.

The following compendium of products introduced in six equipment categories during the first half of 1983 clearly attests to the efforts and achievements of manufacturers in this regard. At a time when sales have flattened out from the accelerating rates of previous years, the hardware side of the industry has chosen not to stay pat with products which themselves represent great advances from previous generations of equipment, even though in many instances, the effort to sell those products has entailed a distasteful detour into stiff price competition. Instead, the manufacturing community is continuing its commitment to ensuring that new developments in technology quickly find their way into CATV applications, most noticeably with regard to advances in microprocessing components.

As a result, the cable operator has a whole new field of products to look over in the categories of satellite reception gear, headend components, coaxial cable, taps and passives, amplifiers, and converters and addressable systems as he designs his new systems and upgrades the old ones. Operators now have the ability to double their satellite reception capacity at minimal costs; to add new layers of security to existing scrambling and encryption systems; to raise their odds in the fight against signal leakage; to deliver up to 550 MHz through active gear that puts out twice as much power for the number of units and to set up the subscriber end of the system just about anyway imaginable.

These developments all are in keeping with the new mood in the CATV marketplace, which is a function both of economic reality and better management.

On a macroscopic level this new mood shows up in the 1983 construction statistics which were projected at the beginning of the year. These figures, appearing in the January 10 issue of *CableVision*, show net plant mileage to be added in 1983 will come to only 80,931 miles at a projected expenditure of $1.6 billion. These totals compare to 83,768 miles of new plant built in 1982 at a cost of $1.6 billion.

The same pattern holds in rebuild mileage, which was projected at 30,658 miles for 1983 at a cost of $111 million, as opposed to 32,422 miles at a cost of $116 million estimated for 1982.

In the seven years *CableVision* has been compiling such statistics, 1983 marked the first time the annual figures showed a decline. Nor is this a one-time glitch in the growth curve. Our investigations show that this year really is the beginning of a gradual year-to-year drop in the number of miles to be added between now and the end of 1986—a prediction that seems obvious in light of the fact that most of the new franchises will be built out over the next four years.

Projections from responses to our four-year survey at the outset of this year indicate the industry will be adding 205,000 newbuild miles and about 100,000 rebuild miles through 1986. With nearly 83,000 of those newbuild miles projected for 1983, the remaining year-to-year average comes out to 41,000 miles annually. In the rebuild category, excluding the 30,658 miles slated for 1983, the annual average comes to about 20,000 miles.

As John Egan, executive vice president of Anixter Communications, told *CED* recently, "The industry's days of consuming product at 1979, 1980 and 1981 rates are over. But the truth is, the market is excellent. It's as good as it's going to be. I'd be worried about any company that looks at the current market and says it's got to get better.

"There's a real concentration on inventory reduction as MSOs move away from external financing to cash-flow planning," Egan added. "This causes a momentary disruption for vendors, but it means the industry is being managed better."

Egan noted the typical style of purchasing in the free-spending past went something like this: "If a project called for construction at 100 miles per month, the company would put in an order for 200 miles worth of equipment right off the bat and then schedule deliveries of 100 miles per month every month after that. But, of course, they had the usual delays in getting the project started, so some three months beyond the time they expected to get the project underway, they would still be waiting to start, only now with 300 miles worth of equipment on hand. In the fourth month, they might have actually built 50 miles, but they had another 100 delivered, so their inventory now was up to 350 miles.

"The MSO today wants to prevent this. He wants to cut lead time, work with a smaller investment at any given time and let someone else carry the costs of

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handling and storing the equipment."

Better management is also resulting in more thorough assessment of product alternatives and a willingness among MSO executives to take whatever time is necessary to answer some basic questions about the business. As John Bacon, assistant group executive for communications products at Scientific-Atlanta, observed recently, "This is a period of assimilation for the industry."

There is much to assimilate: less-than-rousing returns in the early marketing phases of major city newbuilds; a variety of approaches in the search for optimum channel capacities for different markets; experience with the current generation of addressable converters; market experiments with multi-tiering and pay-per-view and the technological lessons of operations in the two-way 400+ MHz environment.

To the manufacturers, it is already clear that the assimilation process is producing a new attitude among buyers. RCA Cablevision Systems, like many other hardware firms, has discovered a major factor in current demand is the need for flexibility in equipment. "If you make an investment, you want it to pay itself off before you replace it," notes RCA's manager of creative services, Wade Hansen. "You don't want to commit to a system that you can't change quickly. You don't want to have to spend heavily on a complete system that is going to be outmoded and overpriced when new technology comes along."

Ideally, Hansen said, the cable executive wants to design his new system or upgrade with an eye toward meeting current needs while ensuring he has the ability to incorporate new developments that he knows are on the horizon. "They're out there asking for this," he commented. "The smart thing is for manufacturers to respond to this demand."

In virtually every equipment category one can find signs that the "smart thing" is being accomplished. One of the most significant developments in this regard over the past six months has been introduction of dual beam TVRO modification technology. Although Hughes Communications developed the dual beam modification some ten years ago, its application was limited because CATV satellites were not positioned in adjoining orbital slots. But with the launch of Hughes' Galaxy I (see page 18) this has changed

Joining Hughes with the new retrofitable devices for existing antennas are Comtech, M/A-COM Video Satellite, Microdyne and Scientific-Atlanta. In tests conducted last year Hughes demonstrated that signal loss for two satellites spaced four degrees apart was approximately one-half dB, which is imperceptible to the human eye. Scientific-Atlanta, in similar tests of its own dual beam modification kit, found the loss to be the same or less.

Another major group of advances involves amplifiers, with feedforward technology, super hybrid components and expansion to 550 MHz figuring in a number of manufacturers' product introductions. General Instrument's Jerrold Division, for example, has a new line of 550 MHz amplifiers and the 600 MHz frequency agile headend modulator and full line of taps and system passives to go with the new bandwidth capabilities.

Magnavox CATV Products has brought out "Power Doubling" technology, which was discussed at length in last month's *CED*. Texscan's announcements include advances in push/pull, super hybrid and feedforward—all of which will be available at 500 MHz and later at 550 MHz.

Century III has introduced 500 MHz feedforward equipment, and Scientific-Atlanta has moved into feedforward at 500 MHz and has introduced a new high-gain drop-in product for operators looking to improve efficiency in the 330 MHz range. C-COR has added feedforward at 500 MHz and a new high-gain drop-in product to its lineup as well.

Recent developments in addressable systems have been equally dramatic. Out-of-home addressability is now available in a variety of approaches, including Vitek's and E-COM's addressable tap systems and the Pico addressable trap system to go with products from Texscan, C-COR and Times Fiber introduced in previous years. Other new converter products include a new baseband unit from Texscan, an addressable RF unit from Magnavox employing a new signal security technology known as "Encryptic Encoding," a new unit from Jerrold featuring random encryption scrambling and a one-way addressable baseband unit from TOCOM that permits pay-per-view impulse purchasing over one-way cable systems.

These and many more developments are discussed in the product descriptions appearing in this Tech Review. Of course, there is much more of the story to tell than can be contained in this section. To go with the advances discussed in the six categories covered here there are the many developments associated with test gear (which can be reviewed by the reader in our Tech II section, starting on page 61), optical communications, status monitoring, connectors, construction equipment and production gear.

While it is clear the market is maturing and leveling off, it is equally clear that technological developments are moving forward at a pace that promises to provide cable operators ever more solutions to meeting the challenges of modern CATV. In fact, with fiber and microchip technologies moving forward at a rapid clip, the CATV marketplace shows every sign of remaining a busy, lucrative field for years to come. **CED**

Satellite Reception Equipment

Amplica

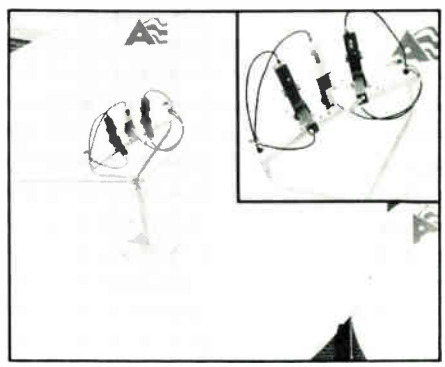
The **RC-20 low noise converter receiver system**, with infrared remote control, LED readout and detent tuning, is joined with the Amplica low noise amplifier to accomplish amplification, frequency conversion and channel selection in a single weatherproof package. **The Model A10021** power inserter enables the user to DC power in the LNA at the earth station terminal through the RF coaxial cable, eliminating the need for separate cabling in providing power for the LNA.

Amplica, Inc.
950 Lawrence Drive
Newbury Park, Calif. 91320
(805) 498-9671

Anixter/Mark

The **Multi-Beam Feed System** for 4- and 5-meter earth station antennas can accommodate up to five prime focus feeds, receiving simultaneous programming from the current four-degree-spaced satellites. Gain of the four-degree off-boresight beam is within 0.5 dB down from the original antenna, while gain of the eight-degree off-boresight beam is less than 1.5 dB down from the original antenna. The system is available in a complete antenna package or as a retrofit kit for existing 4.0 and 5.0 Mark antennas.

Anixter Communications, Inc.
4711 Golf Rd.
One Concourse Plaza
Skokie, Ill. 60076
(312) 677-2600



Anixter multibeam feed system

Antenna Technology

The **Tri-Sat Antenna**, an extension of the firm's multibeam satellite product line, receives signals from three adjacent satellites simultaneously. It is manufactured in 4- and 5-meter parabolic versions.

Antenna Technology Corp.
895 Central Florida Parkway
Orlando, Fla. 32809
(305) 851-1112

ANYWAY YOU LOOK AT IT...

ADM HAS YOUR ANTENNA!

AND YOUR TVRO SYSTEM. Rapid delivery on ADM's super-efficient 11-foot polar-mount antenna (includes remote controlled polarization rotation system as well!), plus, packages are available for complete systems including LNA, 24-channel tuneable receiver and cabling. Why wait in a long line when you can get the best, today!

A SUPER TVRO ANTENNA SYSTEM. High-quality panelized aluminum 11-foot dish and steel polar mount. Dish weighs approximately 200 pounds, mount 265 pounds. Precision designed, easy installation, zinc chromate base primed and heavy-duty white top finish. The rotating feed is standard! Easily shipped and installed. Choice openings for dealers and distributors.

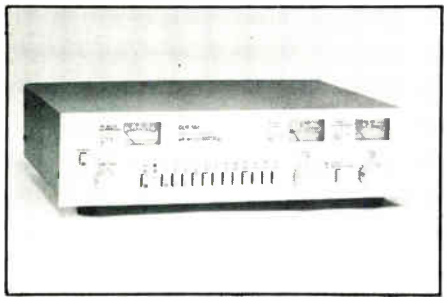
Antenna Development & Manufacturing, Inc.

P.O. Box 1178, Poplar Bluff, MO 63901 (1-314-785-5988)

Automation Techniques

The **GLR-560 imageless satellite receiver**, featuring single-board construction and a new digital detector, has a better than 7.5 dB carrier-to-noise threshold and a 30 MHz bandwidth. The GLR-560 also features new dual audio channels for direct or matrix stereo, pushbutton transponder selection and a front panel relative RF signal meter to control dish orientation and monitor the condition of satellite receiving components. A front panel polarity control switch has been added to the firm's GLR-500, GLR-520 and GLR-560 receivers to provide polarity control from the receiver unit.

Automation Techniques, Inc.
1550 N. 105th East Ave.
Tulsa, Okla. 74116
(918) 836-2354



GLR-560 satellite receiver

Avantek

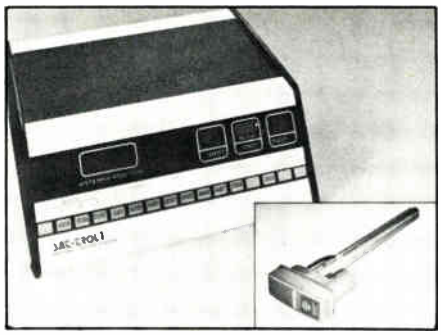
The **AR1000 Simulchannel video receiving system**, through use of either one mainframe and one LNA/downconverter or four mainframes and two LNA/downconverters, can receive up to six separate channels simultaneously. Downconversion may be at either the antenna or the receiver sites, and the modular design makes the system suitable for retrofitting or for expanding existing systems. LNAs are offered with noise temperatures as low as 80 K with 48 dB of gain.

Avantek, Inc.
3175 Bowers Ave.
Santa Clara, Calif. 95051
(408) 496-6710

Basic Systems

The **Model 2250 Antenna Position Control**, a combination manual and automatic programmable system, can select any of 12 satellites with the hand-held infrared remote control or with front panel controls. Recent technical advances, using infrared communication links, have made short-range remote control a possibility without significant price increases, and many trouble prone mechanical switches have been replaced by reliable solid-state components.

Basic Systems
1919 S. 129 East Ave.
Tulsa, Okla. 74108
(918) 437-7066



Burr Engineering SAT-TROL actuator

Burr Engineering

The **SAT-TROL actuator and control system** for earth stations features east/west "touch label" switches with fast and slow travel rates for satellite location and a three-digit LED readout for satellite position. No programming or wiring complicates system installation. Other features include a self-contained power supply with strokes to 52-inch, a 1,000-thrust capacity, an underground cable with shielded sensor cables and a die-cast aluminum power head with a zinc-plated inner and outer tube.

Burr Engineering
130 East Michigan
Battle Creek, Mich. 49017
(616) 965-7255

Comtech Data Corp.

The **7.3-meter dual axis polar mounted antenna**, through use of an optional motorized drive and microprocessor controls, can cover the full satellite arc from any location in the continental U.S. The main reflector consists of twenty close-tolerance, high-strength panels mounted to aluminum radial supports, which are attached to a central hub. Efficient performance, with mid-band gain of 48 dB, is achieved through use of a high efficiencey case-grain feed system.

The **CD 250 dual conversion up/down converter** is designed for data and analog transmissions via satellite and operates in the 3.7-4.2 GHz and 5.925-6.425 GHz frequency bands. Available either as an upconverter, downconverter or duplex, the CD 250 comes with various options, including intelsate equalizations, independent transmit-receive functions, redundant switching and higher stability oscillators.

The **RCV 750 frequency agile receiver** tunes the frequency band of 3.7-4.2 GHz and features block conversion with the Comtech Uni-Shelf concept for mounting the receiver control card.

Comtech Data Corp.
350 North Hayden Rd.
Scottsdale, Ariz. 85257
(602) 949-1155

Gardiner Communications

The **Model 4350 satellite receiver** features block-downconversion (first IF, 940-1940 MHz; second IF, 300 MHz), double conversion, standard remote control capability, improved video group delay correction and 100 to 130 volts rms per input. The unit's 1.75-inch height permits increases in channel capacity in a standard rack.

The **Model 4500 modulator**, designed to achieve low-power consumption and space efficiency, combines audio and video to produce a high-quality vestigial sideband signal and contains the following components: a terminal block for audio input; a video/audio meter and full +60 dBmV output; a miniaturized SAW filter for improved group delay and channel performance; a peak white limiter for prevention of carrier cutoff by over-modulation; and a quartz oscillator for video and aural carrier reference. All modulators are equipped with channel 2 through W capabilities and have all controls, including RF monitor and voltage test points, on a front panel.

The **3.7-meter antenna**, available with single or dual feeds, employs a tripod mount that can achieve 360 degrees elevation without requiring special orientation. The antenna has eight interchangeable fiberglass petals and can be roof, pad or pier mounted.

Gardiner Communications Corp.
3605 Security St.
Garland, Texas 75042-7680
(214) 348-4747

Harris Corp.

The **Intelsat Qualified Antenna** is a 6.1-meter, easily transportable high gain earth station that achieves full elevation coverage without field adjustments and, when equipped with the properly polarized feed sub system, can operate with any Domsat or Intelsat geostationary satellite from any location on the globe. All antenna subassemblies can be loaded on a 2.5-ton truck or in the cargo bay og a C-141 or C-130 aircraft.

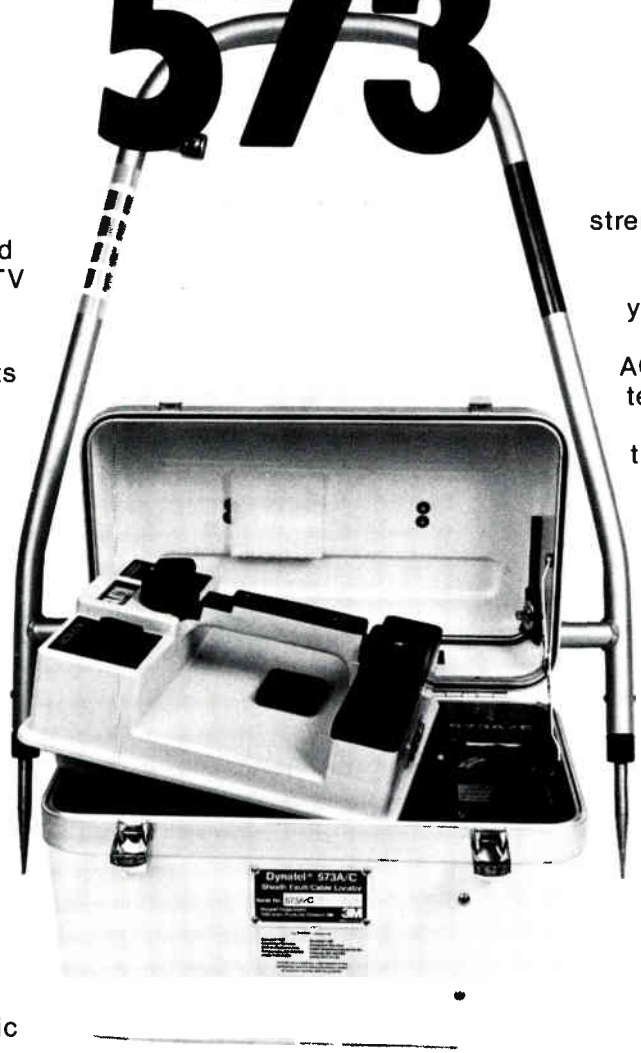
Harris Corp.
P.O. Box 1700
Melbourne, Fla. 32901
(305) 724-3445

Hughes

The **dual beam feed system** permits cable operators to receive programming from adjacent satellites three to five degrees apart with an increase in the signal-to-noise ratio of less than 0.5 dB. The unit, which can be retrofitted onto existing earth station antennas, is suspended from an adjustable support structure permitting the cable operator to direct the antenna to varying orbital locations and

SON OF DYNATEL®

573



This is our new Dynatel 573A/C. It has the best shield to earth fault and buried CATV cable locating performance specs in the business.

The improvement over its predecessor is that it has 3 operating modes. You select the right one for the job you have to do.

The RF mode helps you solve most shield to earth fault and center conductor cable locating problems. On short isolated cable runs and in complicated joint service areas. The RF tracer tone is put on the cable without direct coupling too. That saves you time and money.

The AUDIO mode helps you work over extended distances on trunk cable routes. Even on runs over a mile long. Or use it on long haul fiber optic systems that incorporate metallic strength conductors.

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

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

A 3M Dynatel 573A/C will pay off on your next underground job. Call toll-free 800/634-0004. In California call toll-free 800/526-0006. We'll show you how to get and keep the picture.

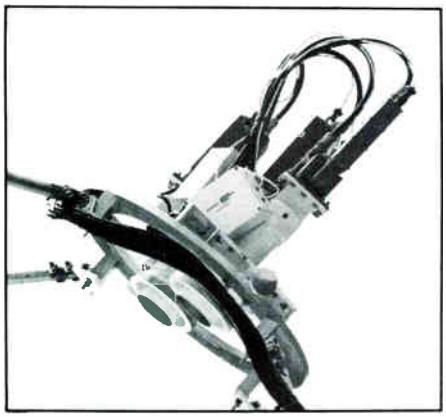
Dynatel Department
TelComm Products Division/3M

3M Hears You...

3M

to adjust the unit for changes in satellite spacing.

Hughes Microwave Communications
P.O. Box 2999
Torrance, Calif. 90509
(213) 517-6233

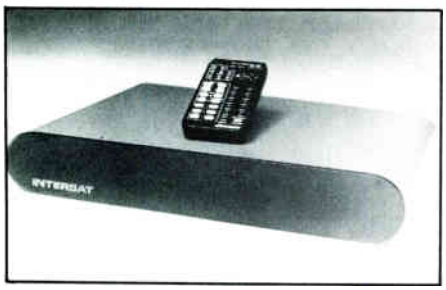


Hughes dual beam feed system

Intersat

The **IQ-160** is a microprocessor-based receiver equipped with remote control and with a memory that exceeds that of most home computers. The system can provide 16 pre-set programs and offers complete volume control, preprogrammed video and audio and the capability of selecting any audio subcarrier between 5.5 and 9.0 MHz. The system can use more than one receiver on a single antenna, has quartz-synthesized tuning, and includes bass, treble and balance controls along with matrix stereo and direct stereo capability.

Intersat Corp.
2 Hood Drive
St. Peters, Mo. 63376
(800) 325-6122



Intersat IQ-160 receiver

Jerrold Division General Instrument

The **Model C4R receiver** employs a block downconverter at the dish and very low-cost receivers at the headend, making it attractive for cable systems requiring large numbers of receivers as well as for systems with low-cost headends. Features include 7.0 dB threshold to provide excellent picture quality during adverse receiving conditions; 24-channel frequency synthesized tuning, allowing tuning of the 12 horizontal or 12 vertical channels, depending on which polarization is input, without fine tuning adjustments; 70 MHz receiver IF, permitting use of the most readily available terrestrial interference filters; and a bar-type signal strength meter. The system's block downconverter, **Model C4LNB**, converts 4 GHz signals to 950-1450 MHz for transmission to the headend and uses low-cost cable from dish to headend.

Jerrold Division
General Instrument Corp.
2200 Byberry Rd.
Hatboro, Penn. 19040
(215) 674-4800

Jones Futurex

The **JFX 1000A receiver** offers a block downconverter option to provide flexibility in system configuration and to facilitate longer cable runs. Receiver and downconverter may be used with existing low-noise amplifiers or with existing low-noise converters. Threshold Extension Demodulation is offered as an option to provide improved performance over conventional demodulators.

Jones Futurex, Inc.
9700 Fair Oaks Blvd.
Suite G
Fair Oaks, Calif. 95628

KLM Electronics

The **Sky-Eye VI** receiver offers VHF-cable/satellite source switching that automatically isolates local VHF-cable signals when the receiver is in use, preventing co-channel interference. Weak signals are processed by a narrow-wide bandwidth control for improved signal-to-noise ratio.

The **Memory-Trak dish-control console** has a 50-satellite memory and is designed for use with the firm's X-11 satellite antenna and Polar Trak motorized mount. The console features a digital selection and readout panel, fully variable single knob polarity control and full east/west manual control as well as an eight-hour memory retention to protect against power outages.

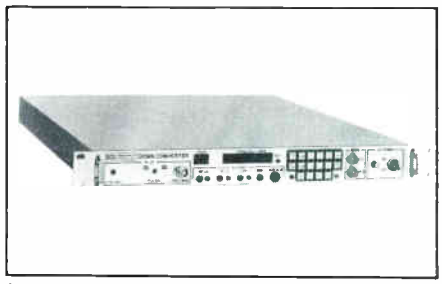
KLM Electronics, Inc.
P.O. Box 816
Morgan Hill, Calif. 95037
(408) 779-7363

KLM Sky Eye VI receiver

LNR Communications

The **Model UC6L-D3** and **DC4L-D3** synthesizer-tuned agile up/down converters for earth stations are designed for use in 4- and 6-GHz SCPC and TDMA transmission systems, respectively. The converters use digital PSK or FM modulation for transponder switching and provide "1-for-N" protection for those times when frequency agility within a transponder is desired. Up to 30 different frequencies or transponder numbers may be stored in the user-programmable microprocessor memory, and channel frequency assignments may be reviewed and changed while the converter is online. The unit, 1 3/4 inches high, is completely self contained and can be used for data, FM FDM, video and audio.

LNR Communications, Inc.
180 Marcus Blvd.
Hauppauge, N.Y. 11788
(516) 272-7111



LNR's DC4L-D3 down converter

M/A-COM Video Satellite

The **motorized 5-meter antenna** is a remotely controlled unit that tracks the entire geostationary arc. The polar mount is available in two options—painted or hot-dipped galvanized for highly corrosive environments. During installation, the control unit is coded for all satellites of interest, while a manual override is available for "cherry picking."

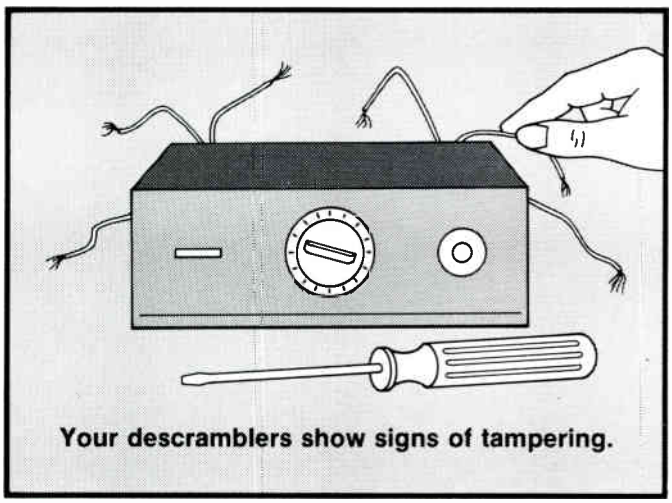
The firm's **feed for mini-cable television systems** allows simultaneous reception of signals from a maximum of three adjacent satellites with a single parabolic antenna. Each of the three prime focus feeds accommodates two LNAs or LNBs for reception of both vertically and horizontally polarized signals from up to three satellites within an eight-degree arc.

M/A-COM Video Satellite, Inc.
43 South Ave., Bldg. 1
Burlington, Mass. 01803
(617) 272-3100

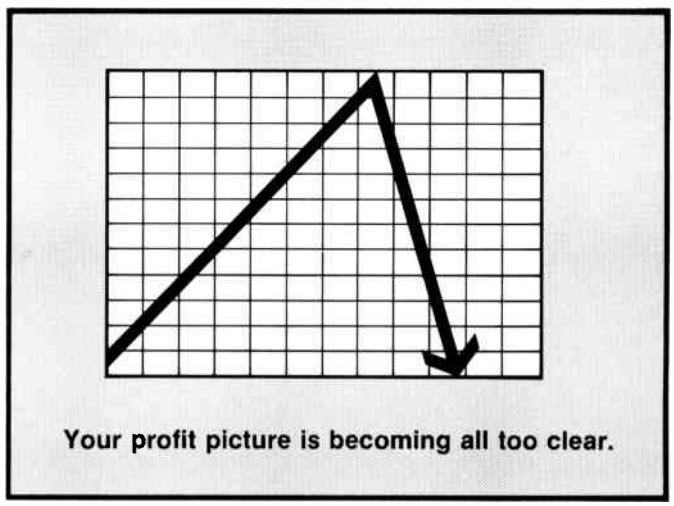
Microdyne

The **MSF 16 multisatellite feed system** can receive three satellite signals over 16 degrees of orbital arc when installed on a Microdyne 5-meter antenna. Two satellites with four degrees spacing will have a loss from boresight gain of almost 0 dB, while a satellite positioned six degrees from boresight will result in

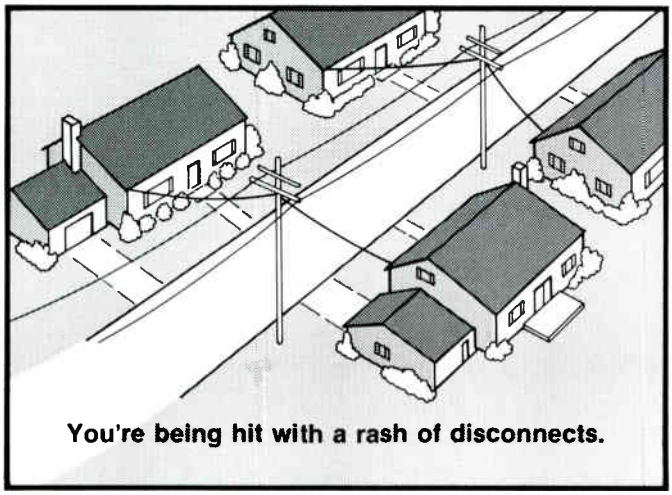
HOW TO TELL WHEN YOUR DESCRAMBLERS NEED VITEK.



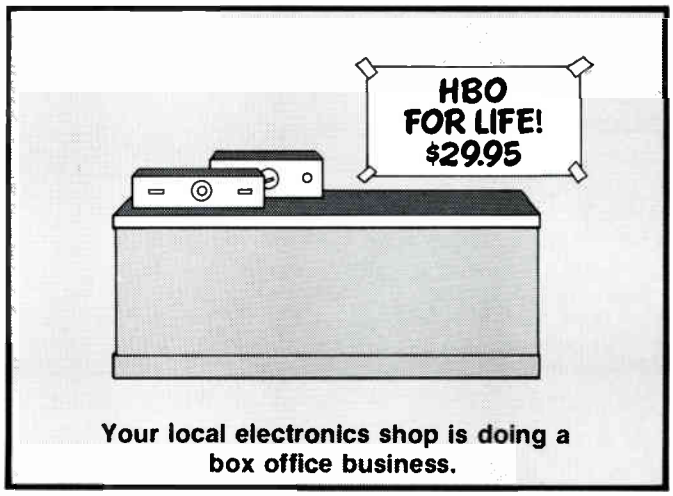
Your descramblers show signs of tampering.



Your profit picture is becoming all too clear.



You're being hit with a rash of disconnects.



Your local electronics shop is doing a box office business.

The bad news is that even the best new scrambling equipment can be beaten, and you can see it happening to you. The good news is that Vitek can help you stop it.

Vitek's Descrambler-Trap™ offers extra protection for scrambled systems. Installed outside the home, the Descrambler-Trap prevents encoding information from reaching the subscriber. It stops unauthorized descrambling, prevents equipment damage, and safeguards your revenues.

When you see you're being cheated—you know you need Vitek. Call us today.

AUGAT® VITEK
Quality and Innovation

Engineered like no other trap.

Vitek Electronics, Inc., 4 Gladys Court, Edison, New Jersey 08817 (201) 287-3200

gain loss of approximately 2 dB.
Microdyne Corp.
491 Oak Rd.
P.O. Box 7213
Ocala, Fla. 32672
(904) 687-4633

Microwave Filter

The **4294 interference canceller**, installed between the downconverter and video demodulator of the TVRO receiver, can eliminate up to 5 dB in terrestrial interference without damaging reception quality and can be used instead of 60 and 80 MHz traps in those cases where broadcast quality pictures are required. The unit also features an impedance of 75 ohms, is compatible with IF circuitry and comes with a 19-inch rack mounting panel.
Microwave Filter Co.
6743 Kinne St.
East Syracuse, N.Y. 13057
(800) 448-1666

Microwave Filter 4294 canceller

National Microtech

The **commercial grade 5-meter antenna** for C-band receivers is a 16-segment compression molded fiberglass reflector on a galvanized steel mounting structure. The antenna, which can be aimed at any domestic satellite, has a dual polarity feed allowing access to all 24 channels available on a particular satellite.

The **Apollo Q-1 receiver and downconverter**, a mid-priced unit, features pushbutton transponder selection, automatic polarity control, an audio IN signal strength meter display and a built-in modulator. A separate downconverter with an integral LNA power block completes the package.
National Microtech, Inc.
5120 Galaxie Drive
P.O. Box 12426
Jackson, Miss. 39206
(800) 647-6144

Phasecom

The **Model 3900** is a solid-state microprocessor-controlled block downconverted receiver that is used with the Model 9120 low-noise amplifier/downconverter. The system downconverts the 3.7-4.2 GHz satellite band to the 950-1450 MHz intermediate frequency range, well outside the UHF television broadcast band. The unit features third order loop threshold extension circuitry in the phaselock demodulator, automatic gain control and video/audio processing and can be remotely controlled using a socket on the rear panel connected to a remote RS-232-C serial interface or parallel input turning selector. The receiver is offered either as a TVRO component or as a prepackaged system.

The **Model 9120 low-noise converter** is a compact antenna-mounted receiver front-end for C-band satellite earth stations combining advanced GaAs FET low-noise amplifier technology with the firm's latest down conversion circuitry in a rugged, weather-proof aluminum case. One LNC unit is capable of serving many tunable or fixed-frequency receiver/demodulators. Overall gain is 55 dB, and the equivalent noise temperature is 120 K, with +/-1 dB full band gain variation.
Phasecom Corp.
6365 Arizona Circle
Los Angeles, Calif. 90045
(213) 641-3501

Scientific-Atlanta

The **Ku-band earth station receiving system**, handling transmissions from 11.7 GHz to 12.2 GHz, is comprised of a Series 9000 Ku-band earth station antenna, a series 361 low-noise converter and a Model 6651 video receiver, with configurations developed to meet Anik C, SBS, OTS, ECS and other specifications. The series 9000 antenna is designed for high-quality reception, while the Model 6651 and low-noise converter are used together for block downconversion, which eliminates the need for expensive microwave components in each receiver.

The firm's commercial quality **elevation-over-azimuth mount** for its 4.6-meter earth station antenna is designed for rapid, accurate pointing and reduced cost installation. The foundation does not have to be aligned to a specific heading to achieve complete 360 degrees azimuth coverage from any location in the contiguous U.S.
Scientific-Atlanta, Inc.
Box 105027
Dept. A/R
Atlanta, Ga. 30348
(404) 925-5947

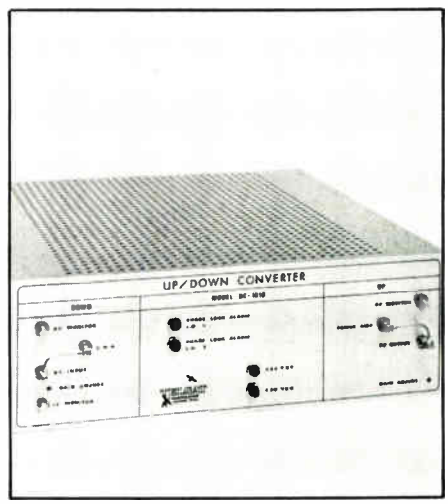
S-A Ku-band earth receiver station

Standard Communications

The **LNBC24 low-noise amplifier/block downconverter** combines a high gain LNA with an advanced block downconverter design in a unit designed for mounting at the earth station antenna. The unit features GaAs FET technology, 100 degrees K noise temperature, a 1.5 dB noise feature and 55 dB gain.
Standard Communications Corp.
P.O. Box 92151
Los Angeles, Calif. 90009
(213) 532-5300

TELSAT

The low-cost **model SC1010 fully synthesized up/down converter** permits easy selection of transponders of C-band satellites and features compact packaging and microstrip/modular construction. An oven-stabilized crystal oscillator provides frequency stability and low-phase noise.
TELSAT Corp.
6515 Corporate Drive
Suite D
Houston, Texas 77036
(713) 270-0081



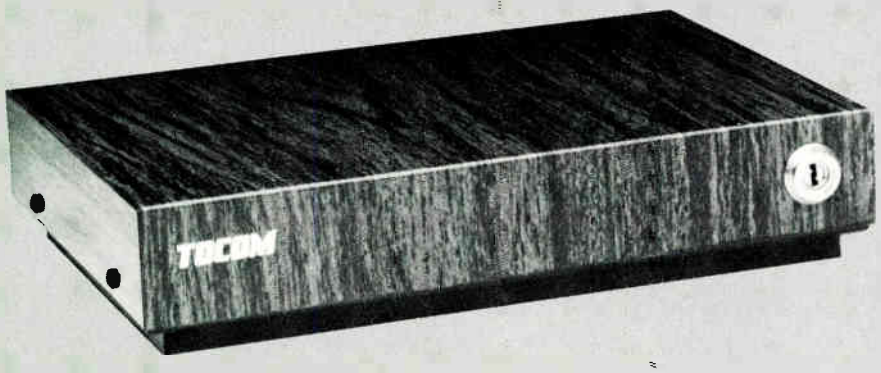
TELSAT SC-1010 converter

Winegard

The **Model SC-5000** and **SC-5001 earth station packages** consists of an 8-foot spun-aluminum parabolic antenna; a heavy-duty polar mount with buttonhook feed; a 120-degree low-noise amplifier and polarotor; a deluxe receiver with antenna-mounted down converter; 150-foot cable; and all necessary hardware. The dish has a gain of 37.5 dB and F/D ratio of .375 and uses a prime focus feed with automatic polarity selection. The model SC-5001 employs a more sensitive 100-degree model LNA. Both units use the model SC-7032 receiver.
Winegard Co.
3000 Kirkwood St.
P.O. Box 1007
Burlington, Iowa 52601
(319) 753-0121

UPGRADE TO BASEBAND ADDRESSABILITY WITHOUT PUTTING YOUR OLD CONVERTERS INTO RETIREMENT

PROTECT YOUR INVESTMENT WITH TOCOM'S NEW ADD-ON ADDRESSABLE BASEBAND DECODER



If your system invested in multichannel RF converters, you are all too familiar with the problems of signal piracy, not to mention the expense of truck rolls each time that a subscriber requests a change-of-service, or is disconnected. The only solution available has been to discard your substantial investment in converters and replace them with complete baseband units. Until now!

UPGRADES MOST CONVERTERS

The TOCOM 5501 is an economical, compact add-on baseband decoder. Despite its attractive price and small size, it is a full-feature, state-of-the-art baseband unit. Its low cost is achieved by using the tuner in your existing RF converters. Virtually any multichannel RF converter can be coupled with the 5501 by connecting it between the existing converter and the subscriber's TV set.

OUTSTANDING CAPABILITIES

The TOCOM 5501 Addressable Baseband Decoder is designed for ease of use. Complete control of scrambling, addressability, and pay services are provided by its microprocessor design. Thirty-two flexible channel packages replace restrictive tiering providing over four billion possible distinct combinations on a 55 channel system. Up to 255 pay-per-view programs may be active at one time. An optional key-switch-operated parental control feature allows any of eight parental access ratings to be preselected.

In addition to the outstanding scrambling and video qualities, the 5501 uses a SAW filter to correct adjacent channel problems common to older-model TV receivers. For ease of service, each 5501's digital section includes a built-in diagnostic circuit with LED.

ADDRESSING COMPUTER AT NO CHARGE

The delivery price of the Addressable Control System (ACS-1000) is as attractive as its many exciting features. TOCOM will provide the base ACS-1000 at no charge with volume orders (10,000 units or more) for any combination of TOCOM add-on decoders (5501) or complete units (5504) shipped by December 31, 1983.

This makes the TOCOM line the best-priced addressable baseband system in the industry.

TOCOM's new ACS-1000 is based on the advanced Hewlett-Packard 1000 model A600 minicomputer. Unlike single-user desktop units, the ACS-1000 is capable of expansion to handle up to 200,000 separate converters with 20 operator CRT consoles. A billing computer interface is standard. ACS-1000 software provides baseband scrambling control, pay-per-view event control, access to optional subscriber and terminal databases, and much more.

FLEXIBLE SYSTEM DESIGN

It is practically impossible to outgrow TOCOM's Addressable System. Since all 55 PLUS products are compatible, you can install any combination of 5501 Addressable Baseband Decoders, 5504 one-way and 5510 teletext and videotex two-way capable terminals and "grow" the system by adding capacity to the headend equipment and computer system.

REAL ECONOMIC ADVANTAGES

Instead of putting an expensive RF converter investment into early retirement, the RF unit can be retained for its tuning function and coupled with TOCOM's 5501 Addressable Baseband Decoder. Immediate cost savings can result on the money saved on truck rolls due to "spin" and/or "churn". Slow or non-paying subscribers may be disconnected in seconds on the day that they become delinquent, saving valuable royalty fees and encouraging prompt payment. In many systems a 10-20% pay penetration increase can be realized, since former pirates are forced to buy the services that they had been previously stealing.

Baseband scrambling and addressability provide price performance, cost savings, and increased revenues — all real economic advantages of the 5501.

Base ACS-1000 supplied at no charge with volume orders of 10,000 units or more.

To place your order or receive more information call:

Wayne Burress (West) 214/438-7691
Neil DeCostanza (North) 201/398-5200
John Cummings (South) 214/438-7691
Sid Prothro (National) 214/438-7691

TOCOM

The Leader in Interactive Cable Technology

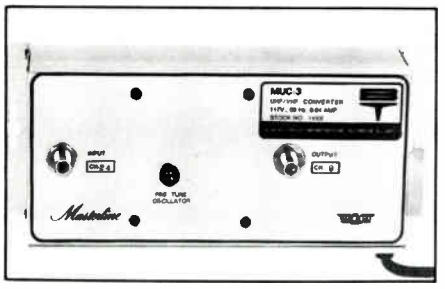
Headend Equipment

Blonder-Tongue Laboratories

The **MCX-U UHF-to-VHF converter** is a crystal controlled single-channel unit designed specifically for use in high-quality MATV headends. A low-noise figure combined with high input capability allows for a large dynamic range window.

The **Masterline MUC-3 single-channel UHF-to-VHF converter** is factory-tuned for a specific customer-selected conversion and is designed with a temperature compensated L-C oscillator, with uniform gain made to be independent of channel conversion. The system's high-input capability and low-noise figure help achieve a wide dynamic range over the entire UHF band.

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



Blonder-Tongue's Masterline MUC-3 converter

Broadband Engineering

The rack-mounted **VFA-450 headend amplifier** is designed to amplify a system's headend signals before feeding them into one or more trunk lines. The unit, which may also be used as an instrumentation amplifier or for field sweep amplification, has a directional coupler for sweep insertion and a die-kept filter, which may be used to recover return trunk signals.

Broadband Engineering, Inc.
211 Commerce Lane
Jupiter, Fla. 33458
(800) 327-6690

Comtech Data

The improved **CDM 1155 modulator** features SAW filtering and an IF loop-through function, which provides compatibility with scrambling systems. The unit, which continuously tunes the frequency range from 54 to 439 Mcs through a digital switch on the front panel, is available with standard IRC frequencies and, if necessary, can be furnished with HRC frequencies.

Comtech Data Corp.
2350 North Hayden Rd.
Scottsdale, Ariz. 85257
(602) 949-1155

Futuresat

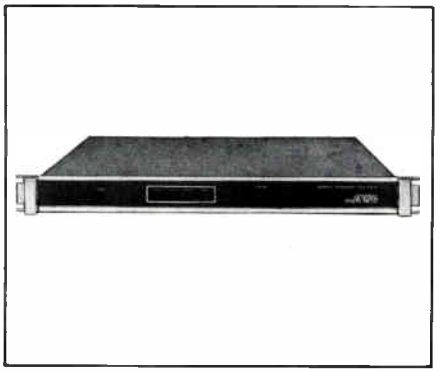
The **multi-unit CATV/SMATV headend** is custom designed for each CATV or SMATV installation to provide from 2 to 64 satellite channels and any number of off-air channels. The headend, which comes fully assembled (and burned in) and only needs to be plugged in for immediate on-line performance, includes built-in security TV switches, an automatic V/H electronic selector switch, and an energy management panel.

Futuresat, Inc.
315 Larkfield Rd.
East Northport, N.Y. 11731
(516) 266-1121

Jerrold Division General Instrument

The **Commander C4P and C4PP phaselock** and **non-phaselock signal processors**, with SAW filter for either HRC or IRC operation, offer enhanced mechanical and thermal stability and fewer coil or trimmer adjustments than previous processor models. Standard components of the C4P and C4PP are: IF switching with loss-of-signal sensing; AGC for substitute signals; built-in override alert switching; and a built-in standby for 30 VDC backup power. Some of the options include a carrier signal replacer plug-in module for applications where the processor is used on pilot channels; a second IF module; a phaselock board; and a 4.5 MHz sound trap for microwave applications.

The **Model C4APC agile phaselock headend converter**, designed to work with the firm's Starcom V residential baseband converter, utilizes a double conversion signal processing technology. The unit is an "all-channel" output converter for HRC carrier assignments handling IF input from any modulator or processor with 50 or 600 MHz bandwidth capability (HRC spacing only). The unit uses the 48 MHz reference from existing comb generators so that a new comb generator is not needed to reach the higher frequencies and permits phase-locking of all HRC channel assignments. No tracking filter or mechnical adjustments are required when changing from channel to channel.



Jerrold C4APC headend converter

The **Starcom Digital Scrambler/Encoder** (DS/E), superseding the model SSE encoder, scrambles the RF headend signal by suppressing the video sync information for one CATV channel during the sync interval. A timing recovery signal added to the sound carrier of the scrambled channel decodes the headend signal. The unit is compatible with all existing Jerrold converter/descramblers and when used with the new Starcom 450 and Starcom V converter/descramblers may be used in the pseudo random mode, wherein the scrambler randomly jumps between 6 dB and 10 dB sync suppression or 6, 10 and 0 dB sync suppression.

General Instrument
Jerrold Division
General Instrument Corp.
2200 Byberry Rd.
Hatboro, Pa. 19040
(215) 674-4800

Microwave Filter

The **3329-57 bandsplitter** separates the entire sub-band and TV-IF from the remainder of the VHF spectrum channels three through W and can also combine these bands. Passband loss is 1.5 dB (maximum), and mutual isolation is 45 dB (minimum).

Microwave Filter, Inc.
6743 Kinne St.
East Syracuse, N.Y. 13057
(800) 448-1666

Octagon-Scientific

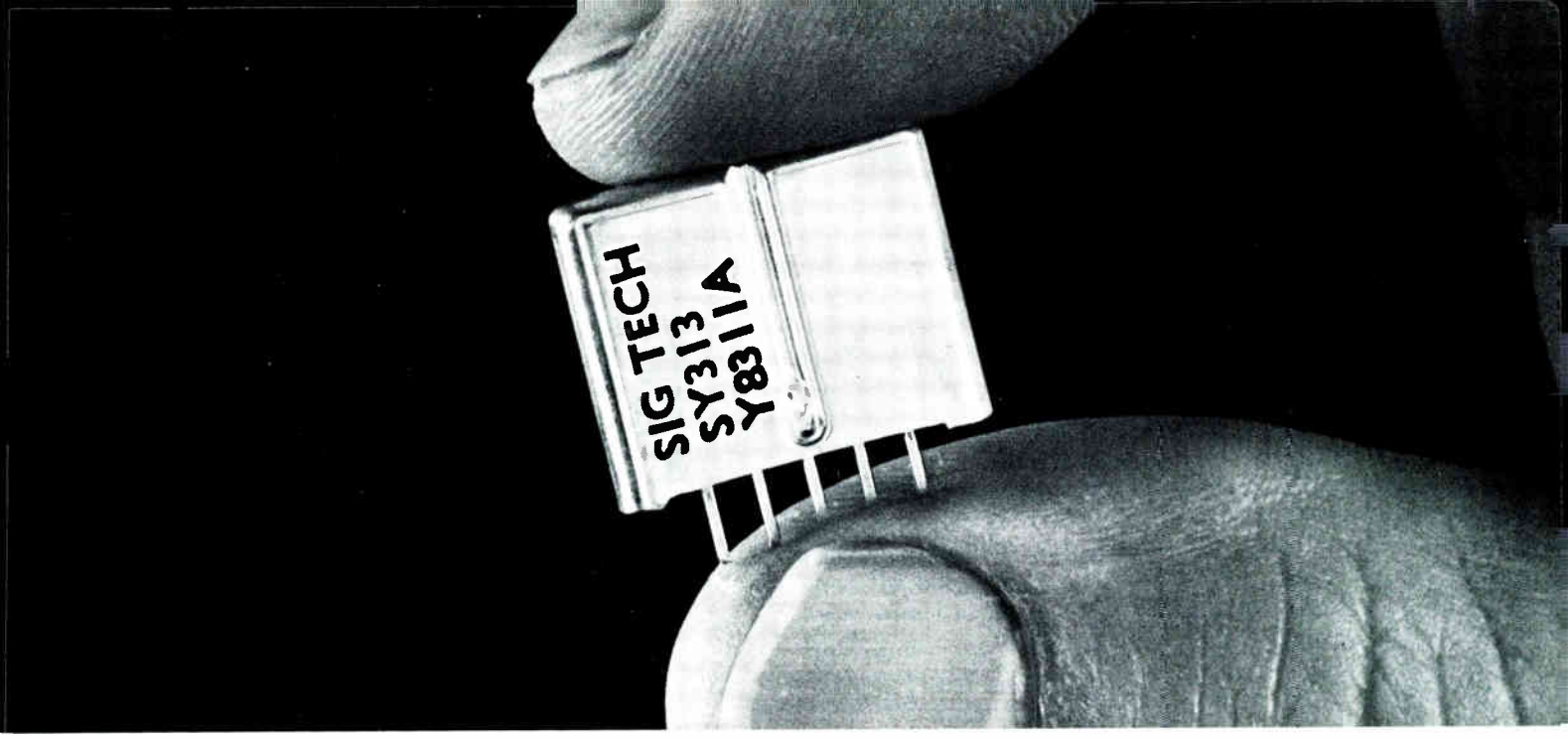
The **headend scrambler 001** uses three scrambling modes—standby, primary, dual—and three control modes—local, remote, addressable—and has a potential of 128 tiers. The Jerrold-compatible unit has a scramble gain of 2.5 dB and standby gain of 0 dB with the IF switching section maintaining an input level of 50 dBmV and a noise figure of 10 dB.

Octagon-Scientific Inc.
476 East Brighton Ave.
Syracuse, N.Y. 13210
(315) 476-0660

Phasecom

The **Model 2550 video scrambler**, with 128-tier potential, utilizes the most popular form of square wave sync suppression and is compatible with a wide range of descramblers from major manufacturers. The unit includes microprocessor control and non-volatile memory, with all encoder/modulator interconnections performed at IF level to eliminate potential picture degradation due to video loop-through. Filters on both video and aural IF outputs prevent interference with adjacent channels. The unit can be used with any modulator that includes external aural and video IF loops.

The **Model 3140 frequency agile standby modulator** is a microprocessor



SAW devices with mass appeal.

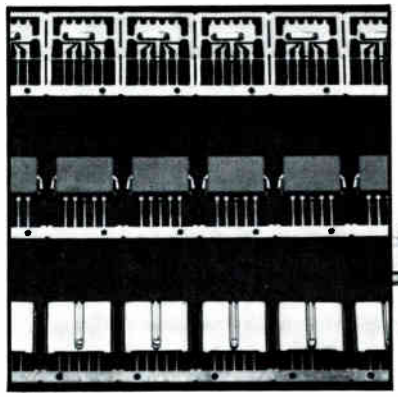
Produced by Signal Technology

Now you can enjoy all the benefits of acoustic wave technology at the lowest possible price, thanks to the mass production capabilities of Signal Technology Ltd, our sister company in Swindon, England.

Signal Technology is the largest independent manufacturer of commercial SAW devices in the world. Their fully automated production facility includes 100% computer testing that records the performance of every device. And their special assembly equipment produces up to 2,000 finished devices per hour (that's one device every two seconds).

Large Volume, Large Selection

These devices are available in either 5- or 8-lead TO-8 cases or in proven, single-in-line (SIP) metal cases that provide unequalled electrical and environmental performance. These single-in-line devices can save you important space on your PC boards. They're auto insertable. And they've passed 96 hours of autoclave tests (four times

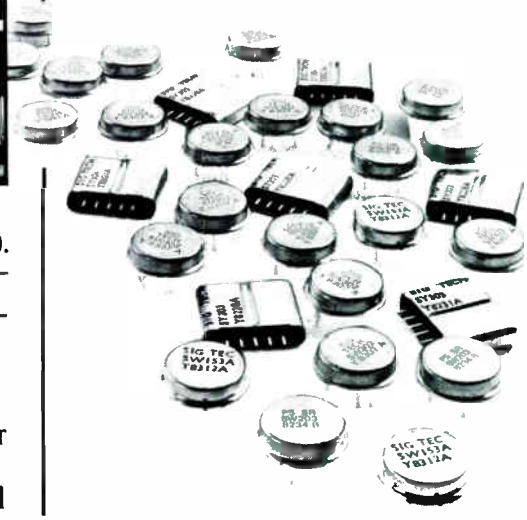


better than the industry's most stringent requirements).

Available from Andersen

These devices are distributed in the U.S. and Canada by Andersen Laboratories. We're a leading manufacturer of SAW devices ourselves (we were the first commercial producer of sideband filters for CATV). And we're ready to put our acoustic signal processing expertise to work on any application you might have.

We have SAW devices for all international broadcasting standards at common IF frequencies, as well as low band VHF filters. Many devices are available from stock. Just call Don Lowcavage at (203) 242-0761.



ANDERSEN LABORATORIES

Andersen Laboratories, Inc., 1280 Blue Hills Avenue, Bloomfield, CT 06002 Telephone (203) 242-0761/TWX 710-425-2390

Andersen SAW products are available in the United Kingdom and Europe through our sister company, Signal Technology Ltd., Swindon, Wiltshire, UK.

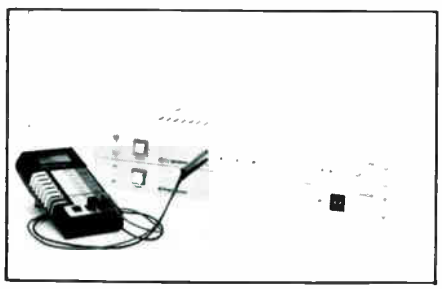
controlled unit digitally tunable to any one of 59 channels and compatible with all existing IF and baseband scrambling systems. Computer control of dual independent audio and video inputs provides automatic handling of primary and secondary programming, while input video AGC and input audio limiting ensure that no adjustments are needed when switching input sources.

Phasecom Corp.
6365 Arizona Circle
Los Angeles, Calif. 90045
(213) 641-3501

Synchronous Communications

The **Model IFM/FAOC-38 and IFM/FAOC-68 frequency agile standby modulator systems**, capable of handling 38 to 68 channels, respectively, feature an IF modulator that can be used in conjunction with the firm's standard frequency agile output converters. Among the new design concepts is the phase-locking of the audio and video carriers to the same reference crystal, ensuring extremely stable carriers.

Synchronous Communications, Inc.
1701 Fortune Drive
Suite O
San Jose, Calif. 95141
(408) 262-0541



The IFM/FAOC-38 modulator system

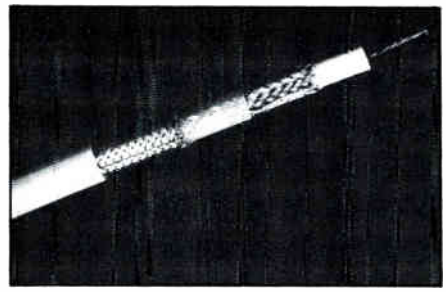
Coaxial Cable

Belden

The **Models 9913, 9914 and 9915 50-ohm low attenuation, flexible coax cables** have been designed as alternatives to semi-rigid cable to allow for ease of installation while maintaining similar electrical parameters in applications for cellular radio, satellite communications, microwave and other two-way communications. The three cables are RG-8/U type air dielectric, RF-8/U type foam dielectric and RF-218/U type solid polyethylene insulated coax, respectively.

The **Model 9192 PVC jacketed 11/U type double shield triaxial cable** is the same as the Belden 9232 except that PVC replaces the hypalon jacket, thus reducing the cost. The 9192, designed for independent production vans incorporating ENG/EFP type applications, passes the UL VW-1 vertical wire flame test and has a .520-inch outside diameter.

Belden Electronic Wire and Cable
2000 South Batavia Ave.
Geneva, Ill. 60134
(312) 232-8900



Belden 9192 PVC-Jacketed Triaxial Cable

M/A-COM Comm/Scope

The **Quantum Reach** series of coaxial cable features a new low-mass dielectric that gives the cable superior handling characteristics and far more flexibility than was previously possible in solid sheath coaxial cable. Quantum Reach maintains 98 percent of its core-to-outer-conductor strength after extended thermal cycling and provides optimum-thickness in the outer conductor tube, achieved by high-speed induction welding of aluminum strips, which reduce the weld zone area to fractional proportions. Maximum attenuation ranges from .09 dB per 100 feet at 5 MHz to .99 dB per 100 feet at 450 dB for the QR 860 cable and from .13 dB per 100 feet at 5 MHz to 1.54 dB per 100 feet at 450 MHz for the QR 500 cable.

M/A-COM
Comm/Scope Marketing, Inc.
P.O. Box 1729
Hickory, N.C. 28603
(800) 438-3331

M/A-COM quantum reach cable

Scientific-Atlanta

The **CableFlex Series CX**, a low-loss, 450-MHz coaxial cable, has a bending radius equal to five times its diameter, as compared to standard aluminum sheathed cable with a bending radius of 14 to 16 times diameter. The outer conductor of CableFlex is bonded to the jacket to provide superior handling characteristics without cracking or kinking. CableFlex is a 75 ohm trunk and distribution cable with the same attenuation characteristics as third generation GID cable and comes in a range of sizes from .375" to .875".

Scientific-Atlanta, Inc.
Phoenix Coax Division
2920 E. Elwood St.
Phoenix, Ariz. 85040
(602) 268-8744

Taps and Passives

Arvin/Diamond

The **4600 series 450 MHz directional tap** features 5 to 450 MHz bandpass capability and is made of highly corrosion-resistant zinc alloy casting that is zinc chromated and painted with an epoxy-based polyurethane paint. The new metal mesh/neoprene gasket offers enhanced RFI ingress and radiation protection, typically in excess of -110 dB.

Arvin/Diamond
P.O. Box 200
Lancaster, Ohio 43130
(614) 756-9222

Blonder-Tongue

The **TLS series** of power passing, directional trunkline couplers features a wide frequency range (5-400 MHz) and offers excellent backmatch at the tap port, which makes the taps ideal for two-way CATV systems. The couplers have a tapered counter-bore in all entry ports so that the connector gaskets sit perfectly inside the entry port, allowing the metal shoulder of the connector to make total metal-to-metal contact with the entry port at 100 percent RFI integrity.

The **DMT models 4041 and 4042 directional multitaps**, with two and four subscriber drop taps, respectively, are designed for messenger strand or pedestal mounting and can handle a frequency range of 5 to 400 MHz. All units have pressure-tight, weatherproof, heavy-duty aluminum cases and a seized center conductor post that can withstand over 100 lbs. of stress caused by thermal contraction.

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

Unmatched Performance... Yours with these Blonder-Tongue CATV products from

TELE-WIRE

Regularly Stocked at TELE-WIRE'S Nationwide Locations

4706 • CMA-b LOW NOISE, SINGLE CHANNEL PREAMPLIFIER: A low noise, single channel VHF preamplifier. All solid state design featuring two "field effect" transistors provides a very low signal-to-noise ratio. Excellent gain and the ability of the unit to accept a wide range of input signal levels makes the CMA-b ideal for CATV and MATV headend installations. The unit has exceptional immunity to overloads caused by strong adjacent channel signals. A full six MHz bandpass insures excellent color operation. Each unit has 75-ohm F type connectors on the input, output, and test jack.

1526PS • -21 VOLT DC POWER SUPPLY: The 1526 Power Supply delivers a regulated -21 volt DC at 40 ma. It is designed primarily for powering mast-mounted preamplifiers such as Blonder-Tongue's CMA, CMA-U, and CMA-b. It will also power up to three Mighty Mite UHF line reamplifiers. A capristor on the input line protects the unit from power line surges. Its small size, light weight and mounting flanges make it convenient to mount on any flat surface.

4415 • BPF-c VHF SINGLE CHANNEL BANDPASS FILTER: A high quality VHF single channel bandpass filter that provides extremely high rejection off band, even on adjacent channels. Utilizes five high-Q bandpass sections and two phase cancellation traps. The traps are normally aligned to reject the lower adjacent sound and the upper adjacent picture carriers, but can be touched up in the field to reject other nearby interfering carriers. Available for each Hi, Lo, Midband and Superband TV channel and also for FM band.

4454 • MCA-b 3 VOLT OUTPUT, VHF PROCESSOR SINGLE CHANNEL, AGC CONTROLLED: The MCA-b channel processor is a 3-volt VHF TV strip amplifier with automatic gain control and all solid-state circuitry. It is intended to amplify and stabilize the level of a single VHF channel in MATV and CATV headend systems. Features interchangeable broadband amplifier board to facilitate maintenance, adjustable aural carrier control for lower distortion, lightning and line voltage surge protected, true peak detector AGC, wide Dynamic Range.

4928 • EARTH STATION MODULATOR: A high quality, vestigial sideband audio/video modulator with crystal controlled visual and aural carriers. Specifically designed for use with TVRO earth station satellite receivers where audio and video are provided as separate baseband signals. Video low pass filter to reject unwanted secondary subcarrier frequencies of satellites. Extremely accurate crystal controlled 4.5 visual to aural carrier spacing minimizes color beats and audio distortion.

TELE-WIRE SUPPLY CORPORATION

7 MICHAEL AVENUE, EAST FARMINGDALE, NEW YORK 11735 • New York 516-293-7788 • Toll Free 1-800-645-9510

CALIFORNIA	FLORIDA	PENNSYLVANIA	TEXAS
415-794-1821	813-371-3447	717-282-2340	214-988-3226

Drop Shop

The **5-450 MHz line** of top-mount 2-, 3-, 4-, 6- and 8-way splitters pass 5-450 MHz signals indoors or outdoors, provide RF shielding and are individually packed with mounting hardware.

The Drop Shop
176 West Westfield Ave.
Elizabeth, N.J. 07204
(800) 526-4100

Eagle Comtronics

The line of **2-, 4- and 8-way 500 MHz taps** provides RFI figures that far exceed FCC specs while maintaining a very low insertion loss. Construction features include the use of a tap quality corrosion-resistant aluminum alloy; a moisture seal gasket; modular design; either clear iridite or E coating; ports numbered for easy system audit; sealed F-ports in either machine-threaded aluminum alloy or brass; and a sand-bonded finish.

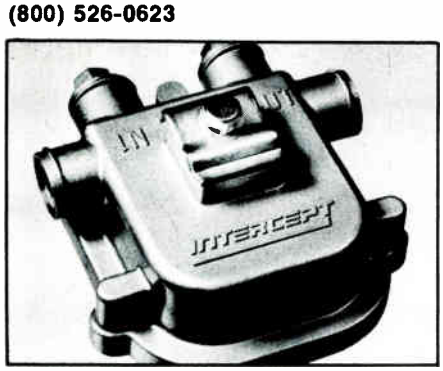
Eagle Comtronics, Inc.
4562 Waterhouse Rd.
Clay, N.Y. 13041
(315) 622-3402

Intercept

The **INT 500 series** of 500 MHz multi-taps covers the complete range of tap values, with two-, four- and eight-output versions available. Each tap's modular design permits the operator to remove the base plate and circuit board as a single unit without having to remove the center seize or the strand mounting. Housings on all units are fabricated of corrosion-resistant aluminum alloy, while other components of the unit are constructed of stainless steel.

The **models HS200, HS300 and HS400 splitters** comprise a two-, three- and four-way hybrid system that features a quad-mounted housing providing for increased flexibility and ease of installation. The units offer sealed die-cast housing and clear-chromatic finish to withstand variable weather conditions and machine-threaded ports to ensure a positive "F" connector fit.

Intercept Corp.
220 Entin Rd.
Clifton, N.J. 07014
(800) 526-0623



Intercept 500 MHz

Jerrold Division General Instrument

The **600 MHz Starline System passives and taps** are designed for operation with the Starline X 550 MHz system. The 600 MHz bandwidth passive system, including splitters, directional couplers and power combiners, comes with a new housing design with 8 RF ports to simplify both aerial and pedestal installations. Efficient power splitting reduces active electronics requirements, and separate RF gasket ensures required shielding for two-way active systems. The taps come in 40 different models to accommodate system design needs at lower construction costs, while the modular design provides complete interchangeability of bottom plates between two-, four- and eight-port models without removing the housing from the cable. Surface iridite chromatic conversion, baked resin coating over a die cast housing and a bottom plate made of high silicon 360 aluminum alloy ensure corrosion protection in hostile environments.

Jerrold Division
General Instrument Corp.
2200 Byberry Rd.
Hatboro, Pa. 19040
(215) 674-4800

LRC Electronics

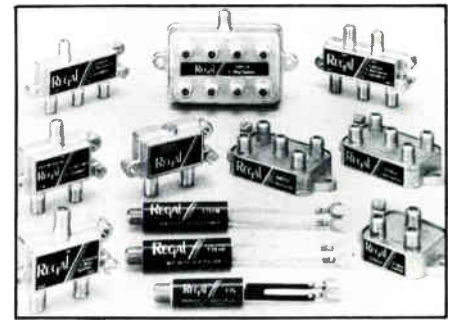
The new pressure tap can be adapted without the use of additional tools to almost any size or type of coaxial cable. The unit consists of a cutting tool and contact pin and works from the side of the cable to remove pieces of insulation and braid without touching the center conductor. In addition, the tap's metal construction helps assure the radiation integrity of the coaxial system.

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

Regal/Anixter Communications

Anixter Communications is the exclusive distributor for a new line of **Regal passives**, which include 2-, 3-, and 4-way horizontally and vertically mounted splitters; standard 75-ohm to 300-ohm matching transformers; FM matching transformers with built-in high-pass filters; ground blocks with high-pass filters; dual 2- and 4-way splitters; and TV-FM splitters. All Regal products operate in the 50-500 MHz bandwidth and are constructed with printed circuit boards to ensure electrical and mechanical consistency from unit to unit.

Anixter Communications
4711 Golf Rd.
Skokie, Ill. 60076
(312) 677-2600



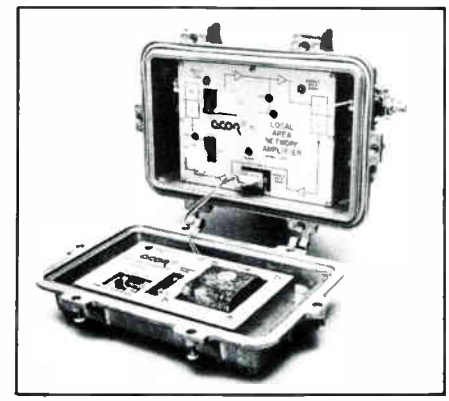
Anixter distributes Regal passives

Amplifiers

C-COR

The **LAN-100 series** of split-band amplifiers provides full-duplex data transmission over a 5-450 MHz bandwidth for broadband local area network data systems. The units offer 35 dB forward gain and 30 dB reverse gain for data communications environments such as highrise office buildings with large amounts of flat loss and for metropolitan area institutional networks where reverse signals are injected into a feeder cable. Other features include a reverse bandpass of 5-112 MHz, a forward bandpass of 150-400 MHz capable of handling most LAN data transmission requirements, and housings that are made of sturdy, die-cast aluminum.

C-COR Electronics, Inc.
60 Decibel Rd.
State College, Pa. 16801
(814) 238-2461



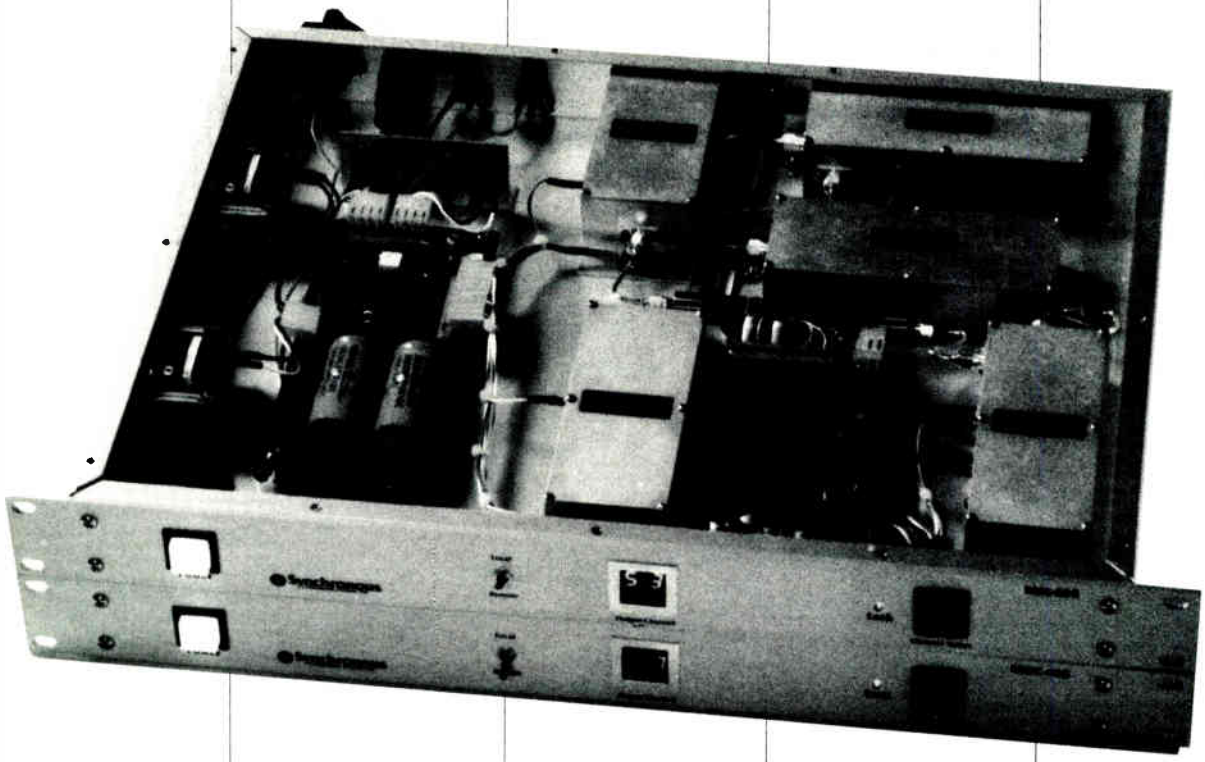
C-COR LAN 100 split-band amplifier

Century III

The **500 MHz feedforward amplifier system** provides units for one- and two-way systems with spacing of 22 dB, 26 dB or 30 dB, featuring built-in redundancy. The series includes trunk, bridger and line extender units, all of which were demonstrated at the NCTA Convention in Houston, June 12-15.

The **4100 Series feedforward trunk amplifier** is designed for use in total cable systems, long-haul super trunk systems

THE BEST FREQUENCY AGILE HEADEND CONVERTERS YOU CAN BUY



HERE ARE THREE GOOD REASONS TO BUY OUR HEADEND CONVERTERS:

1 We design and engineer every detail of our converters, to insure high **reliability** and excellent **performance characteristics.**

2 Our converters are packaged separately and not with a modulator or signal processor, therefore, our converters can be used with existing headend equipment.

3 **Synchronous** customers know they have bought the best product available.

WE MAKE THE BEST AND WE'RE PROUD OF IT!

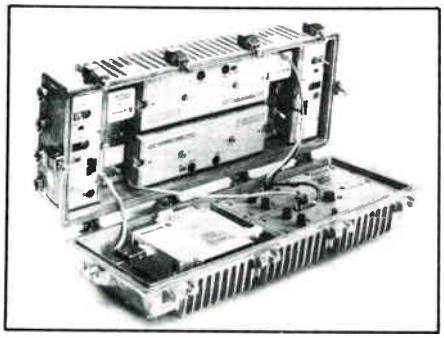
Synchronous
COMMUNICATIONS, INC.

1701 Fortune Dr., Suite O • San Jose, CA 95131 • (408) 262-0541

and high level distribution applications and provides a wide range of capabilities to meet the demands of one-way and two-way trunk distribution systems operating at bandwidths from 50 to 450 MHz. Modular construction affords numerous amplifier configurations within the 8-port housing and allows for easy upgrading, with operating gain options of 22, 26 or 30 dB available in trunk and bridger modules. Signal levels are maintained by automatic gain and slope control circuits, which respond to either dual modulated or unmodulated pilot carriers or video carriers. The amplifiers are convertible to two-way, sub-split or mid-split configurations.

The **4200 Series mid-split and high-split trunk stations** are designed for use in institutional cable systems with the mid-split trunk stations providing 160-450 MHz forward transmission and 5-120 MHz return and the high-split stations providing 235-450 MHz forward and 5-185 MHz return. All trunk station versions feature 22, 26 or 30 dB of forward operating gain and use the latest advances in hybrid integrated circuits coupled with a unique method of noise and distortion cancellation to provide reliability and stability throughout a wide temperature and frequency range.

Century III Electronics International, Inc.
610 Neptune Ave.
Brea, Calif. 92621
(714) 671-2800

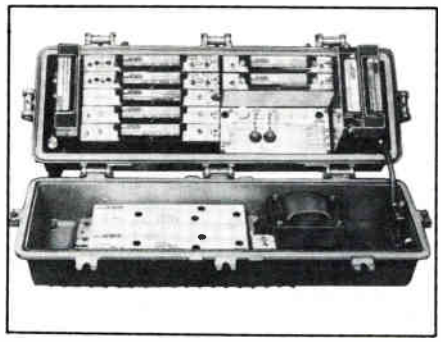


Century III 4200 feedforward trunk station

General Instrument Jerrold Division

The **Starline X series** of low-cost distribution amplifiers provide fail-safe features in three compatible models—X1000 for single cable, X1500 for single cable, redundancy and X2000 for dual cable. The redundant trunk and bridger amplifiers' fail-safe features allow station bypass on command upon module failure or when a module is removed for repair. The redundant design also provides a system distortion benefit that allows unusually long trunk amplifier cascades and extends feeder reach. Institutional capability is provided in mid- or high-split configurations.

Jerrold Division
General Instrument Corp.
2200 Byberry Rd.
Hatboro, Pa. 19040
(215) 674-4800

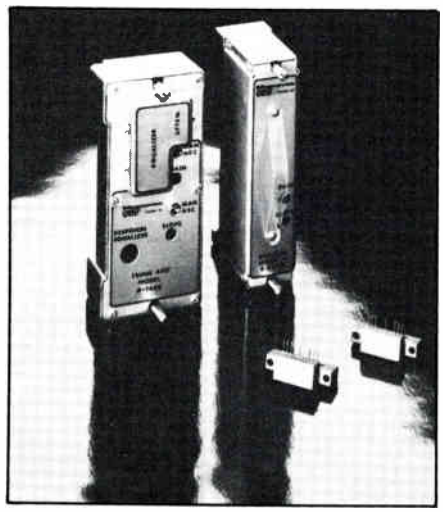


Starline X-1000 amplifier

Magnavox

The **Power Doubling** micro-chip technology is available in two retrofittable plug-in modules that work in the existing Magna 6400 amplifier chassis and housing, providing up to 440 MHz bandwidth at double the output power for the same low level of composite triple beat distortion. A minimum of 6 dB improvement is achieved in composite triple beat and cross modulation specifications over conventional hybrid systems, which translates into a 3 dB increase in output capability. Power Doubling's principal component feature is the distortion reducing post amplifier, which utilizes precise impedance matching techniques. Power Doubling also makes existing amplifiers more transparent, lowering noise by at least 2 dB from conventional systems to a figure of 5.7 dB or better. Main station and line extender gain is increased, and system upgrades to 440 MHz are facilitated with no need for bandwidth compression. Longer trunk cascades are also permitted, thus eliminating HRC and, in some cases, "hubbing" requirements.

Magnavox CATV Systems, Inc.
100 Fairgrounds Dr.
Manlius, N.Y. 13104
(315) 682-9105



Magnavox CATV Systems' power doubling

Scientific-Atlanta

The **Series 6500 450/500 MHz feedforward amplifiers**, offering significantly improved signal distortion characteristics over conventional push-pull amplifiers, include a trunk amplifier available in 22, 26 or 30 dB forward operational gains; a trunk/bridger providing 35 dB of gain; and a line extender with 32 dB forward gain. All feedforward amplifiers use standard plug-in equalizers, pads and feeder makers and are available with optional reverse amplifiers and a status monitoring/reverse switch.

The **Series 6500 high-gain upgrade amplifier** is designed to drop into existing trunk station locations and features 26 dB of forward gain, permitting upgrades from 216 MHz to 300 MHz. Individual plug-in modules for forward and reverse trunk amplifiers, automatic control units, switching regulated power supplies and bridgers simplify the design and installation of both one-way and two-way systems. Reverse transmission is attainable by installing diplex filters and a reverse amplifier.

Scientific-Atlanta Inc.
P.O. Box 105027
Atlanta, Ga. 30348
(404) 925-5000

Texscan

The new **500 MHz conventional, dual-power super hybrid and feedforward amplifiers**, all designed to fit as modules in the same basic mechanical package and housing footprint as the current 450 MHz product lines, will be available in modest quantities by the end of 1983, with full 500 MHz production to commence in the first quarter of 1984. **550 MHz conventional and dual-power super hybrid amplifiers** will be available in the second quarter of 1984, and **550 MHz feedforward** will come on line in the third quarter. Options include mid-split or high-split and redundancy. Both forward and reverse amplifiers can be remotely activated and monitored for operating mode via the Vital Signs Status Monitoring System.

Texscan Corp.
2960 Grand Ave.
Phoenix, Ariz. 85061
(602) 252-5021

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The **Addressable Drop Controller** is much like a negative trap in concept but without the trap's limitation on tiering, allowing the operator to electronically shred the tiers of service to be denied the subscriber, with no additional lines necessary for second sets. The system is

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compatible with cable-ready sets, existing converters and descramblers and can be co-installed with other security methods. It permits up to 12 tiers of service as well as basic, with capacity of 400 MHz, and is transparent to two-way data.

Control Com
Burnup & Sims
Cable TV Products Group
Suite 140
3781 N.E. Expressway
Atlanta, Ga. 30601
(404) 451-5522

E-COM

The **Tier Guard addressable tap system** is designed for strand mounting in 4-, 6- and 8-drop configurations and for multidwelling units in a 16-output mode, with system control effected through a headend 16/32-bit multiprocessor microcomputer along with several area control units, each employing a dual processor 8-bit microcomputer. Together these units manage both downstream and upstream traffic, employing a hard jamming of unauthorized downstream signals for each subscriber tap, thereby obviating any need for descrambling equipment in the home or at the pole. Tier Guard works with any cable-ready television set or non-addressable converter and can be powered either from the subscriber's home or via the distribution system.

E-Com Corp.
AM Cable TV, Inc.
320 Essex St.
Stirling, N.J. 07980
(201) 647-6700

Electroline

The **Electroline Addressable System** consists of three elements—a microprocessor control unit, a demodulator/decoder unit and wide-band multitap switch assemblies—which are configured to control subscriber access and/or subscriber premium services in multi-unit buildings. The system is modular in design, with a microprocessor located at the apartment or remotely, and permits the cable operator to buy the system complexity needed to meet specific tiering requirements.

Electroline Television Equipment, Inc.
8750 Eighth Ave.
Ville St.-Michel
Montreal, Que.
Canada H1Z 2W4
(514) 725-2471

General Instrument Jerrold Division

The **Starcom V**, designed for up to 164 channels, parallels the company's RF addressable converter—the Starcom 450—with baseband technology and other features, including enhanced mechanical security, software downloading, diagnostic test switch for in-home troubleshooting, a variety of scrambling modes and a unique data encryption method. Headend-controlled software downloading enables the system operator to set eight operating parameters—subscriber address, output channel, "barker channel" location, frequency offsets, custom channel assignments, time-out, credit limit and mode—after the converter is installed. Mechanical integrity measures include a digital control board sealed in epoxy resin, a tamper-resistant circuit that destroys converter intelligence if the unit is tampered with and inherently secure LSI circuitry. The Starcom V, which does not require an FCC waiver because it does not degrade the picture, can be mixed with either RF or other baseband converters in a cable system, since it will accommodate sync suppression of 6dB, 10dB or 6/10 dB, and it will also handle either random line or random field inversion, with or without sync suppression.

Jerrold Division
General Instrument Corp.
2200 Byberry Rd.
Hatboro, Pa. 19040
(215) 674-4800

The Jerrold Starcom V converter

Hamlin

The **CRX-5000** 58-channel cordless, handheld remote converter features a frequency synthesized first local oscillator and is available with built-in descrambling and an internal A/B switch for dual cable operation. The remote handheld channel selector operates on infrared wireless remote control and features instantaneous frequency selection, scan up-down channel select and "favorite channel" memory.

Hamlin International
128 SW 153 St. Seattle, Wash. 98166
(206) 246-9330

Intercept

The **Expander 40**, a 40-channel VHF-to-UHF block converter, converts all VHF bands to UHF channels and is compatible with built-in remote tuning and HRC frequencies, with a pass band wide enough for video carriers in HRC headends. Straight-through VHF also is available on a second output port.

Intercept Corp.
215 Entin Rd.
Clifton, N.J. 07014
(800) 526-0623

Kanematsu-Gosho

The **Sprucer II**, a 444 MHz multimode baseband, addressable terminal with a microprocessor-based, phase-locked synthesized converter, provides pay security with a scrambling technique that includes 16 different modes of random video signal inversion. Functions include 15-channel favorite memory; upward/downward scanning; impulse pay-per-view via password entry on all 128 channels; opinion polling; and multilevel parental discretion control.

Kanematsu-Gosho (USA), Inc.
One World Trade Center
Suite 4811
New York, N.Y. 10048
(212) 524-8353

Magnavox

The **Magna 6400 addressable converter system**, with 64-channel capability, provides signal security through a combination of proven RF circuitry and a digital technique known as Encryptic Encoding, which adds random encoding from the headend controller via fully synchronized components. The system controller also continuously sends to each converter authorization data generated either from the customer service software module or from an external billing computer, with separate data bases maintained to track subscriber data and converter authorization and service status. Features include a four-digit fluorescent display, remote control unit, favorite channel designation and last channel recall.

Magnavox CATV Systems, Inc.
100 Fairgrounds Drive
Manlius, N.Y. 13104
(800) 448-5171

Oak Communications

The **second generation MiniCon 2** addressable system provides increased control functions for operators of systems with fewer than 10,000 decoders and allows for upgrading without changes in home terminals or distribution to accommodate system growth up to 27,000 subscribers. The system employs an IBM 5160 microcomputer, which provides controlled delivery of programming on all channels, using the standard TotalControl home terminals in 300 MHz or 400 MHz models, with any mix of scrambled or clear channels possible without the need for dedicated pay channels. Sixteen levels of tiering are available for scrambled channels.

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Miami Beach, Florida

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— *Mr. Sloan*
St. Louis, Missouri

ENGLISH ENTERPRIZES
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1-305- 841-7210
ORLANDO, FLORIDA

The **TotalControl Module 1** (TCM-1) is a universal addressable decoder which fits into any manufacturer's straight converter system and, with the addition of headend equipment, turns that system into an addressable system.

Oak Communications, Inc.
P.O. Box 517
Crystal Lake, Ill. 60014
(815) 459-5000

Pico

The **Outdoor Terminal Addressable System** achieves maximum cable security by using an active trap system requiring deactivation of traps by command from the headend in order for subscribers to receive authorized services. The headend data controller is an independent, self-contained unit capable of controlling up to 100,000 subscribers, with battery-backed C-MOS memory to ensure data retention in the event of power loss. The addressable terminal consists of up to four subscriber modules installed outside the home in a security housing unit, with each module capable of providing up to eight levels of service, including basic. The system is compatible with all cable-ready television sets and standard converters.

Pico Products, Inc.
103 Commerce Blvd.
Liverpool, N.Y. 13088
(315) 451-7700

Pioneer

The **Pioneer/Wegener premium Cable Stereo Audio System** is a secure FM delivery system that includes the Wegener 1601 plug-in stereo processor mainframe, which allows economic and orderly headend cable audio growth, along with the Pioneer stereo audio cable converter, which secures the pay cable audio signal. The system is ready for off-air, satellite or locally originated stereo audio programming options and uses frequencies outside the unprotected FM bandwidth.

Pioneer Communications of America
2200 Dividend Dr.
Columbus, Ohio 43228
(614) 876-0771

Telease

The **Multiple Application Addressable Secure TV (MAAST)** addressable system incorporates two custom LSI chips and three custom microprocessors in the set-top unit to provide an extremely versatile approach to programming configuration, including: impulse pay-per-view over one-or two-way cable systems; in excess of 200 tiers of service; five addressable audio channels per video channel; two-way services through plug-in connections permitting up to 20 devices to operate off the MAAST box to perform such functions as peak-load management, electronic information distribution and automatic telephone dialing and answering; and expanded vertical interval data programming capability. The top level security offered employs sync removal wherein all vertical and horizontal sync is removed; the blanking level is moved to grey level and video is inverted, while data transmitted to control the unit is encrypted through TIES, a proprietary Telease system, that uses a multi-key architecture employing a master key, a unit key, a current month key, a program key and an initializing vector.

Telease, Inc.
1875 Century Park East
Suite 930
Los Angeles, Calif. 90067
(213) 552-1055

Texscan

The **Basecode baseband addressable converter/decoder** has a full function keyboard on the set-top unit, which is duplicated on the hand-held transmitter, with standard tuning frequencies, HRC and A/B cable capability programmed into the unit. Scrambling is achieved by inverting random groups of horizontal lines during the active signal portion, with channel authorization achieved through out-of-band digital signaling. Features include a four-tier parental control lock, continuous volume control, mute, force tune and virtually unlimited pay-per-view availability.

The second generation **RF converter/decoder Model 4045** is a two-way addressable unit featuring selectable default channel emergency TV turn on/off or special channel; remotely changeable parental security code; pseudo random sync suppression descrambling; customer replay acknowledge LED for subscriber feedback; remote selection of HRC, STD or IRC; IRC offset selection of four or six MHz; and two output lines for external control. The unit can be downgraded to one-way by removal of the plug-in transmitter and can be purchased in a non-addressable version designated Model 4023.

Texscan Corp.
3102 North 29th Ave.
Phoenix, Ariz. 85061
(602) 252-5021

TOCOM

The **IV-A Central Data Security System** is an economical headend data system addition to the firm's cable security line designed to support up to 3,000 home terminals with expansion capacity to 8,000 terminals. Features include a downstream transmitter for terminal interrogation, an upstream receiver, a digital interface, a computer system, an operator CRT, a hard-copy printer for alarm logging and base system software.

TOCOM, Inc.
P.O. Box 47066
Dallas, Texas 75247
(214) 438-7691

The **5505 addressable baseband converter**, representing the firm's new generation of baseband products with completely modular design, features a one-way impulse pay-per-view system and allows optional two-way plug-in additions permitting videotex and other interactive, microprocessor-based functions. The unit permits computer downloading to the converter so that new applications can be added without physical access to the converter. Standard features also include stereo, scrambled audio with barker channel; wireless remote control; random dynamic video scrambling; 450 MHz tuner circuitry; preferred channel stack; built-in diagnostics; and 16-level parental access control.

TOCOM Inc.
3301 Royalty Row
Irving, Texas 75062
(214) 438-7691

Vitek

The **VITAP** two-way out-of-home addressable tap system, designed to work with any type of simple converter or cable-ready television set, can supply five channels on an *a la carte* basis and one level of premium tier packaging to several TV sets on each drop. The system does not require scrambling from the headend but scrambles unauthorized signals at the tap box, using random sync generation. VITAP is compatible with existing trapping systems and can be installed in isolated portions of a cable system where high churn or signal theft warrants addressability.

Vitek Electronics Inc.
4 Gladys Court
Edison, N.J. 08817
(201) 287-3200

Zenith

The **TX-1000 teletext decoder** is capable of providing up to 5,000 pages of digital information at a transmission speed of 500 pages per second, with as many as 40 addressable data tiers per 6 MHz video channel possible. The decoder interfaces with the Z-TAC addressable system to permit the operator full control over premium and text services and can be expanded to utilize interactive services such as computerized banking and shopping.

Zenith
100 Milwaukee Ave.
Glenview, Ill. 60025
(312) 391-8338

Communications Engineering Digest

TECH II

CED's feature supplement and Product Profile

Test Equipment

- ☐ Signal level meters
- ☐ Spectrum analyzers
- ☐ Time-selective spectrum analysis

Extending the spectrum analyzer's usefulness through time-selective spectrum analysis

By John L. Huff
Times Mirror Cable Television

Spectrum analysis of radio frequency carriers modulated with video can be made more comprehensive when the time of observation is assisted by a video waveform monitor's timing circuits.

Anyone who has used a spectrum analyzer to observe a television modulated carrier knows the difficulty in seeing through all the video-signal clutter when looking for spurious signals. Spurious signals, VITS and other video RF responses can be observed and recorded easily without interference from other ambiguous video signals.

The technique described in this paper will increase the usefulness of the spectrum analyzer and help provide information that was difficult or impossible to record using previous techniques.

This paper is based on the assumption that the reader has a working knowledge of the spectrum analyzer and the video waveform monitor.

Toward a theory of time-selective spectrum analysis

The concept of time selectivity in spectrum analysis is over 10 years old; it has over five years of practical application history. The scope of this paper is limited to the useful application of time selectivity in analyzing the spectrum of CATV signal carriers.

The minimum additional basic equipment to perform the needed functions are:

- A radio frequency spectrum analyzer with a Z-Axis input.
- A video waveform monitor with field and line select capabilities and the output of horizontal strobe or CRT brightening pulse.
- Time selective spectrum analysis (TSSA) is accomplished with a Z-axis control module to condition and control the timing pulses from the video waveform monitor to the Z-axis input of the spectrum analyzer.
- A television demodulator with a base band video output.
- A means of storing the observed presentation of the spectrum analyzer, such as a storage scope and polaroid camera.

Equipment configuration

1. The equipment is connected as shown in the functional diagram (Figure 1), using proper techniques in handling radio frequency and video signals with coaxial cables.

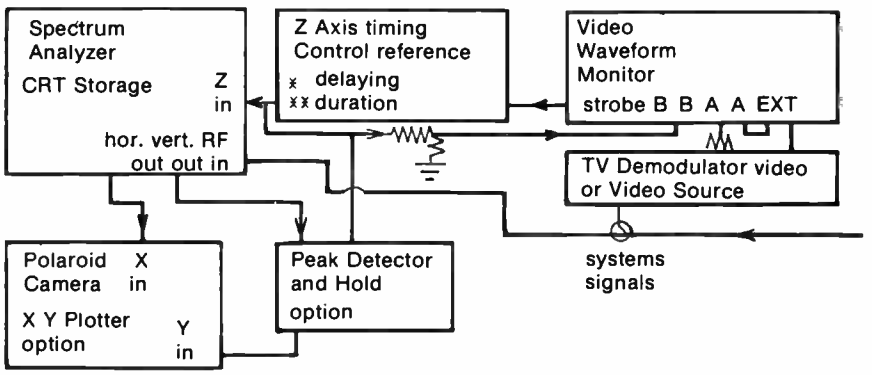
2. The input level of radio frequency carrier of television signals should be of sufficient level to display at least 60 dB of dynamic range of signals above the noise floor of the spectrum analyzer.

3. The spectrum analyzer is to be set to scan radio frequency spectrum of interest with the demodulator tuned to the TV channel which occupies the same frequency.

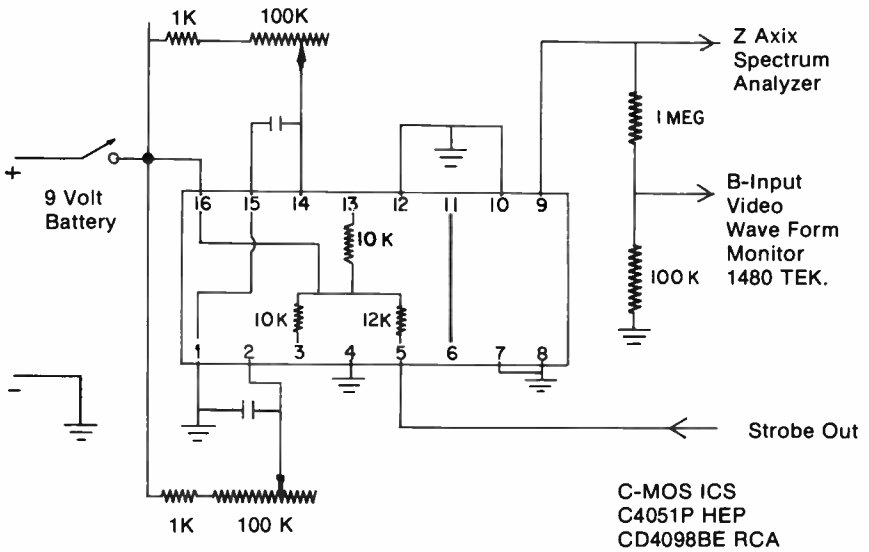
4. The video waveform monitor line select will display an appropriate line, with the sync select on external, the input select on A-B. (With the input select on B, the Z-axis timing pulse is presented.)

5. The Z-axis control module controls the time delay and duration that the spectrum analyzer's Z-axis is turned on. The Z-axis module is triggered by the strobe output of the video waveform monitor.

Figure 1

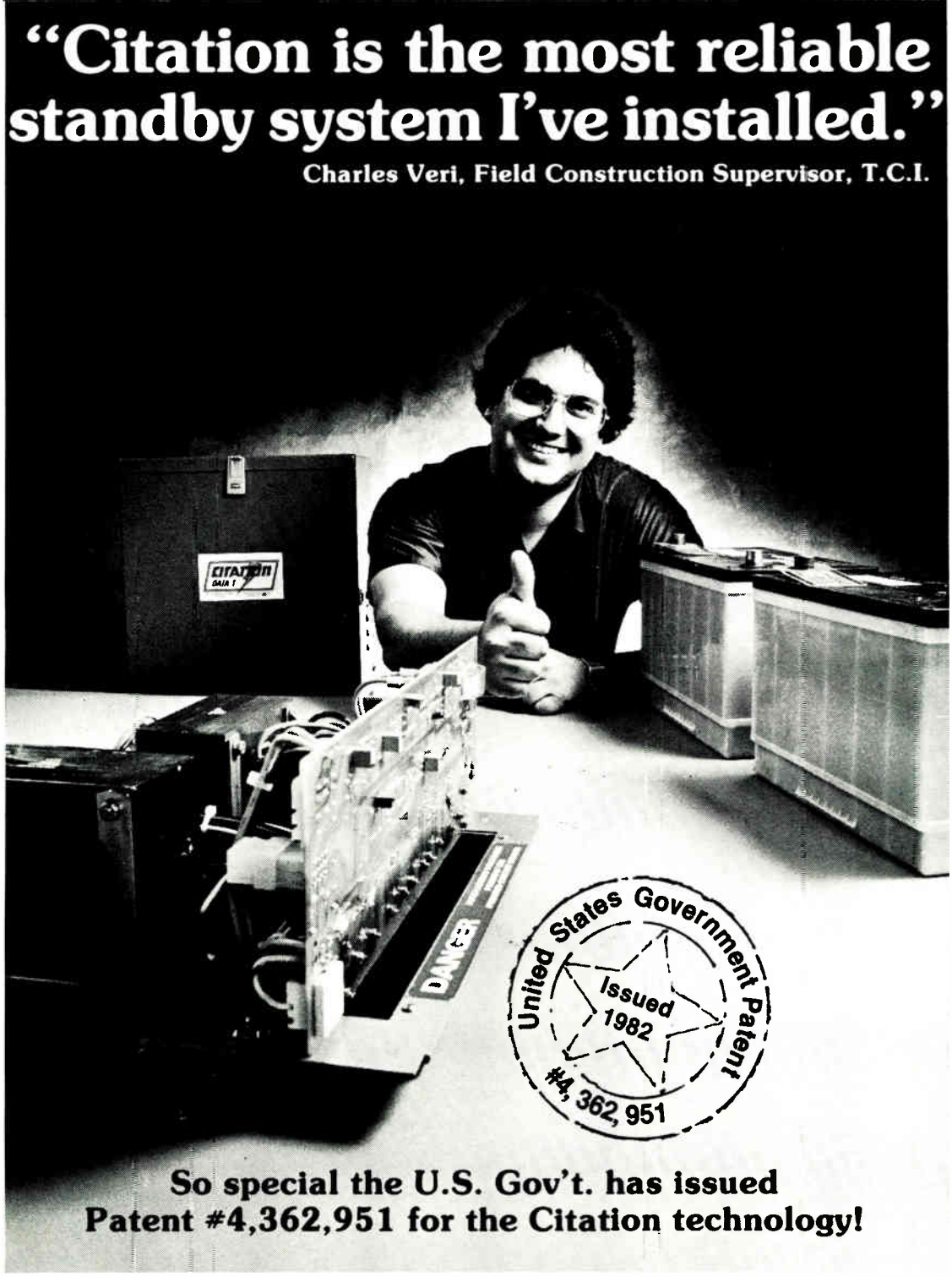


Functional Diagram
Time Selective Spectrum Analysis



"Citation is the most reliable standby system I've installed."

Charles Veri, Field Construction Supervisor, T.C.I.



So special the U.S. Gov't. has issued Patent #4,362,951 for the Citation technology!

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6. The spectrum analyzer is set to scan the frequency range at a rate of from 5 to 25 seconds per horizontal centimeter; the single scan mode is manually started, and the vertical gain is set in the usual manner. The IF bandwidth would use 300, 100 or 30 KHz depending on the desired information.

When all equipment is connected and operating properly, the spectrum analyzer CRT is turned off—except for the very short duration in time selected by the video waveform monitor and the Z-axis control module. The configuration allows repetition of samples of the same duration and time during a television frame; the duration can be from 4 to 65 microseconds at a rate of 30 times a second. The spectrum analyzer scans the spectrum that contains the video modulated RF carrier and associated side-band information that the demodulator is tuned to, such as 52 to 62 MHz for the spectrum analyzer and Channel 2 for the demodulator. The short duration that the CRT is turned on is then stored in progression of the span of the spectrum analyzer displaying the amplitude of the RF energy that is detected during the short duration that the Z-axis is turned on. The number of samples is dictated by the speed of the horizontal scan of the spectrum analyzer and the desired resolution of the recorded data.

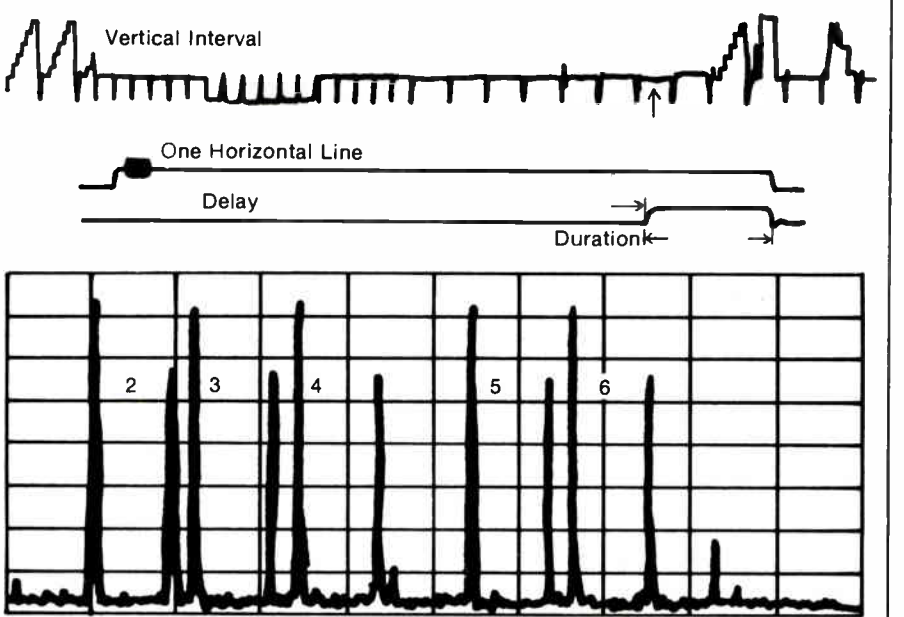
The video waveform monitor is multi-functional. Initially selecting the line in the video frame that is to be analyzed, the horizontal strobe is sent to the Z-axis control module. Also displayed with that line is the desired delaying time with the spectrum analyzer Z-Axis duration time by displacing the normal presentation on the video waveform monitor. The presentation allows critical adjustments to be made on the delaying and duration controls. A small time differential occurs due to the delay in propagation of the RF signal through the spectrum analyzer of 1 to 3 microseconds depending on the IF bandwidth.

It rarely is possible to observe a cable system when no video information is being transmitted; consequently spurious signals can easily be observed with normal spectrum analyzer techniques. The nature of a video signal is such that there are times when there is no change in transmitted carrier power and, therefore, no transmitted sideband energy. It is during these short intervals of time that observation of the television channel can be made without the presence of sideband RF energy. A blank line during the vertical interval is such a time. Fifty-millionths of a second is a long enough time when using the technique described here.

The IF bandwidth setting of the spectrum analyzer will determine the resolution desired.Whereas 30 KHz will pick up spurious CW signals, noise level measurements can best be made using a 300 KHz RF bandwidth.

Most observations will be made with the spectrum analyzer in the 10 dB log vertical display. The resolution is better than 1 dB. Where comparison of amplitude is a narrow range, such as with the vertical interval test signals

Figure 2



Spurious Signals - 30 KHz I.F. Bandwidth 10 dB log the same time is selected for noise.

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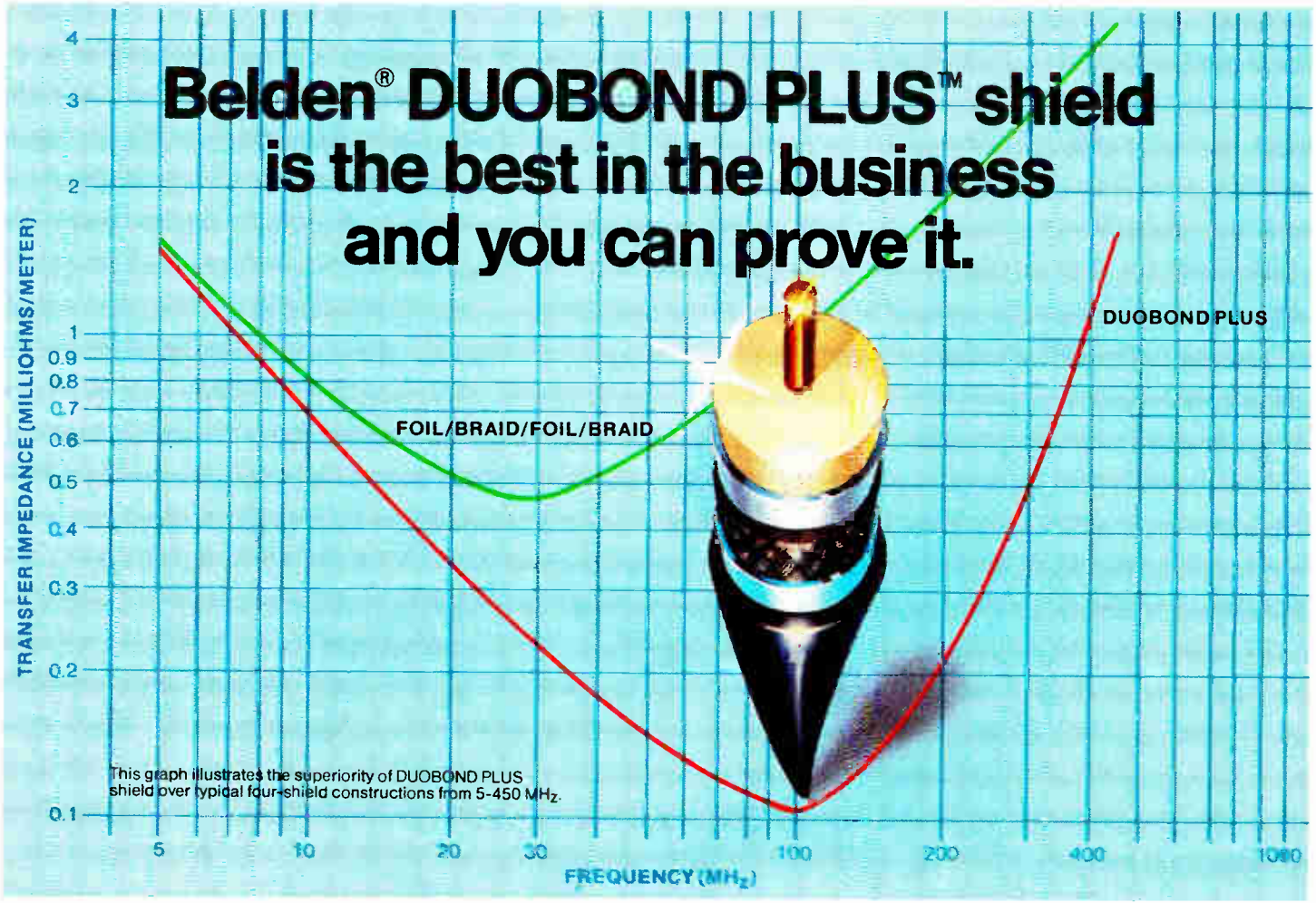
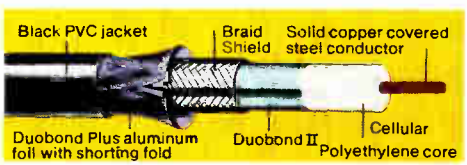


This graph illustrates the superiority of DUOBOND PLUS shield over typical four-shield constructions from 5-450 MHz.

New DUOBOND PLUS drop cable shield can keep performance up and costs down in your CATV operations. Using a unique foil/braid/foil configuration, DUOBOND PLUS shield delivers greater shielding effectiveness than typical 4-shield constructions. It's also smaller in diameter, easier to terminate, lighter weight and more flexible.



Greater shield effectiveness.
As the transfer impedance data above shows, DUOBOND PLUS shield offers far superior shield performance to even the foil/braid/foil cables on the market today. The key to this effectiveness is the use of our unique shorting fold in our outer foil shield. This shorting fold along the longitudinal edge effectively reduces slot radiation normally experienced with traditional overlapping foils.

This protection from signal ingress and egress helps you meet the current FCC requirements limiting radiation from your CATV system. Try it in your toughest interference locations. You'll find that DUOBOND PLUS shield offers the kind of performance you—and your customers—demand from a CATV drop cable.

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Unlike foil/braid/foil/braid cable constructions, the DUOBOND PLUS cable shield does not require expensive oversized connectors. The cable is made to standard industry size to use any popular, commercially available connectors (RG 59, .242" O.D./ RG 6..275" O.D.). Also, the inner foil of the DUOBOND PLUS shield is bonded right to the cable core. That means there's no chance for foil pushback and the signal leakage that frequently results from pushback.

DUOBOND PLUS shield features a unique shorting fold in the outer shield. This fold gives metal-to-metal contact for reduced slot radiation effect.

DUOBOND PLUS shield offers better shielding than this bulkier, more expensive foil/braid/foil/braid cable. The larger cable also requires special, non-standard connectors.

Cables with the DUOBOND PLUS shield are available in RG 59, RG 6 and RG 11 constructions—messengered, non-messengered and flooded versions. And all cables with DUOBOND PLUS shields are 100% sweep tested from 4 to 450 MHz with a minimum return loss of 23 db for RG 59 and 26 db for RG 6. Call Belden for assistance in selecting the cable that's best for you. You'll see that DUOBOND PLUS shield can keep profit and performance up—and costs down—in your CATV cable operations.

Electronic Wire and Cable, Attn: CATV Sales Dept., P.O. Box 1980, Richmond, Indiana 47374.
Phone: 317-983-5200.

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8-14-1D

multiburst, then 1 or 2 dB per vertical division provides greater amplitude resolution.

The polaroid photographs are of spectrum analyzer-stored CRT and the video waveform monitor CRT displays. The plots are from the vertical output of a spectrum analyzer and time domain vertical interval test signals are from a video test signal generator with associated timing delay and duration pulse from the Z-axis control module.

Illustrations

Graphic plots are used here as they best illustrate the magnitude of the information that can be observed and recorded.

The plots showing Channels 2 through 5 (Figures 2-4) are as performed on an operating system.

The entire vertical interval is displayed with markers defining the start and stop of the selected portion to be analyzed. The next time domain display is of a single horizontal line which is included in the portion of the vertical interval display. The third time domain display indicates the time and duration of the Z-axis pulse that is sent to the spectrum analyzer and to the B-input of the video waveform monitor.

The graphic plot is a reduced copy of a standard size graphed plot of a time selective spectrum analysis with a greater than 70 dB display of video carriers showing Channels 2 through 5 with the associated audio carriers.

The polaroid photos (Figures 5-7) are of stored displays on a spectrum analyzer, the RF energy of a single picture carrier and sideband energy from one equalizing pulse and of a VITS multiburst.

Spurious signals

The plot (Figure 2) is of a single television channel with amplitude modulated visual carrier and audio carrier.

The IF bandwidth of the spectrum analyzer is 30 KHz. The vertical calibration is 10 dB per major division and scan is 2.5 MHz per major division.

The single spurious response is residual color subcarrier from a Tektronix 147 video signal generator, and greater than -70 dB from picture carrier level.

The duration of the Z-axis is approximately 5 microseconds. The delay allows the narrow band IF to respond properly.

The carrier level with the blank line is 2.5 dB below peak carrier level at the sync tip.

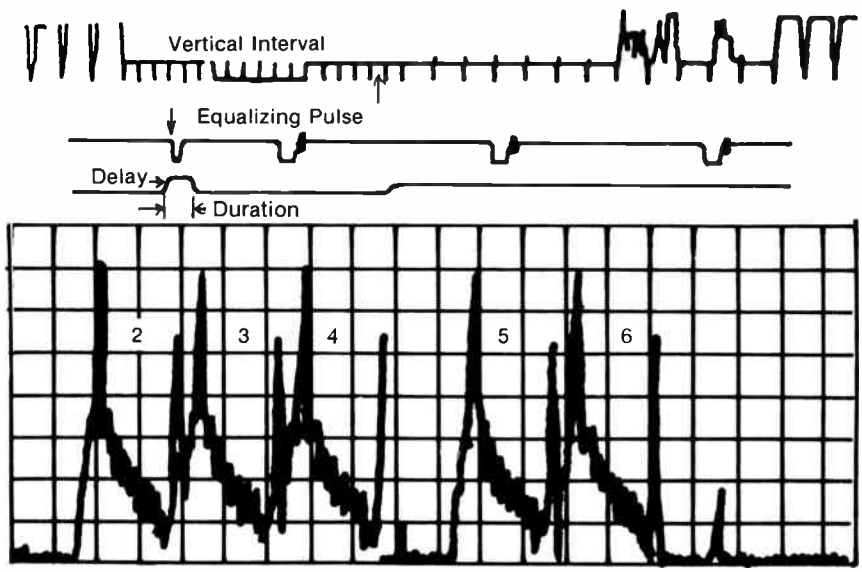
Picture quality

The most significant observation that can be made of a television channel is to examine the energy distribution in the side band frequencies of a square wave pulse. The best equalizing pulse for observation is at the start of line 9 of field 2. (See Figure 3.)

The spectrum analyzer IF band is set to 100 KHz. Although 30 KHz will also perform, it is too detailed for general use.

The number of responses on the upper sideband on a scale of one to ten rating of picture quality is easy. The noise and frequency response contribute directly to the quality of the picture and the rating. A normal horizontal sync pulse will also respond but will normally contain the color burst and have more responses.

Figure 3



Picture Quality - 100 KHz I.F. Bandwidth 10 dB log.

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For more information on Hughes AML systems, write or call. Hughes MICROWAVE™ COMMUNICATIONS PRODUCTS P.O. Box 2999, Torrance, CA 90509, (213) 517-6233. After hours emergency service (213) 534-2170. In Canada, Anixter-MicroSat Communications, 970 Brock Road South, Pickering, Ontario Canada L1W 2A1, (416) 839-5182.

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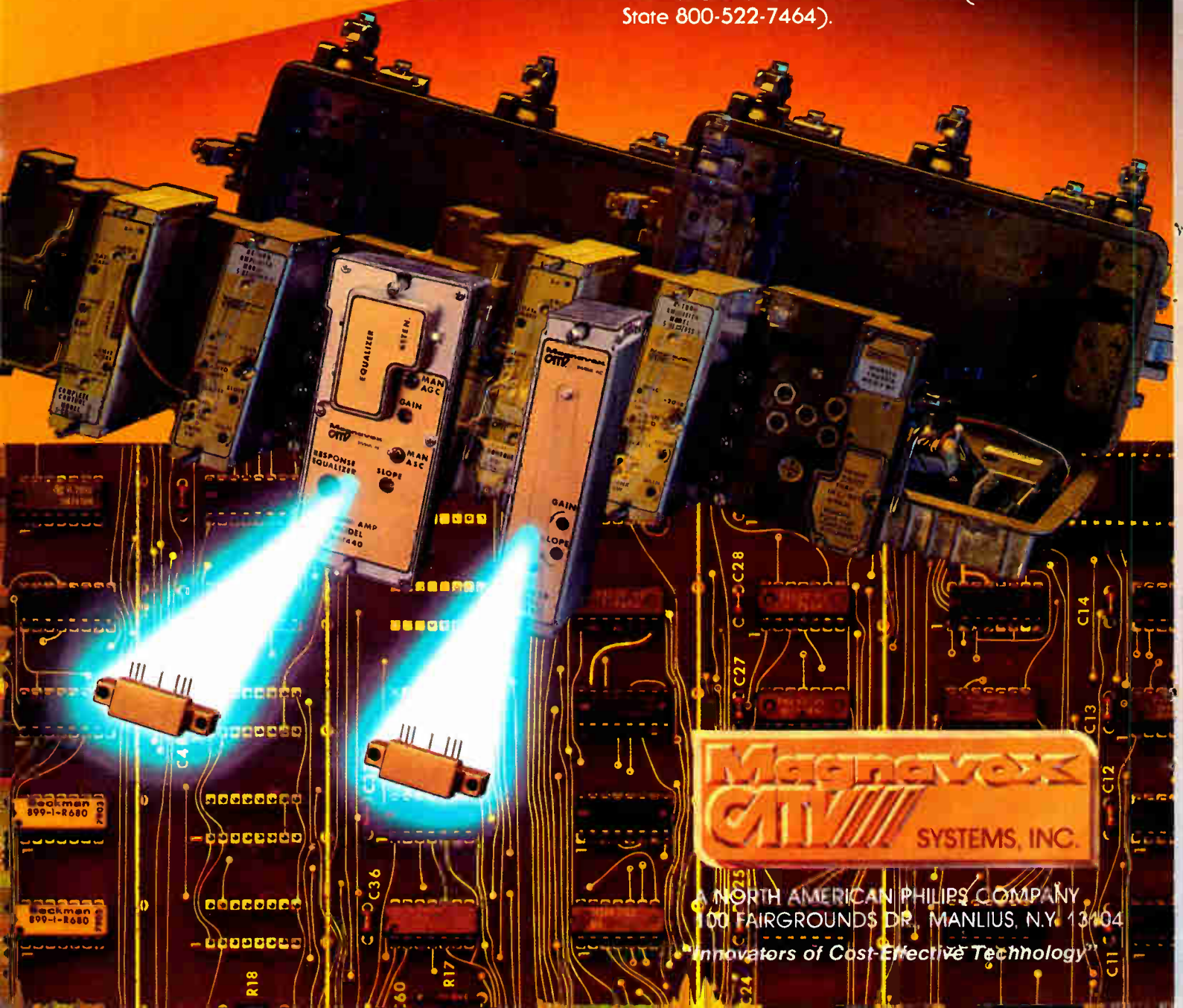

Magnavox CATV SYSTEMS, INC.

A NORTH AMERICAN PHILIPS COMPANY
100 FAIRGROUNDS DR., MANLIUS, N.Y. 13104

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off-position to reduce transit time and is comprised of two 20 dB attenuators with blocking capacitor to protect input.

Blonder-Tongue Laboratories

One Jake Rd.
Old Bridge, N.J. 08857
(201) 679-4000

Leader Instruments endowed its LCF-945 signal level meter with the ability to measure AC voltages from 0-50 Vac with ±5 percent accuracy. The unit is comprised of three 20 dB switchable attenuators and a 25 dB meter scale. Tuning of individual channels is facilitated by the unit's large dials, which are marked with both frequency and channel, and by electronic tuning control and a built-in sound amplifier.

Leader Instruments

380 Oser Ave.
Hauppauge, N.Y. 11788
(516) 231-6900

Sadelco Inc. manufactures three signal level meters which operate in the 54-450 MHz frequency range.

The DL-200 VS is a digital signal level meter, featuring: easy-to-read LED display, auto-ranging attenuation, a detector switch that provides a choice of accurate pulse peak or noise detection modes, a logic module containing an analog-to digital converter and a semiconductor complement. The unit can be set for automatic shut-off at a pre-set interval.

The 733C Super, designed for basic signal measuring purposes, has two tuners covering VHF and superbands. Each tuner has its own dial, which allows the unit to be operated as two signal level meters.

Sadelco's FS-3D-VS signal level meter also can be operated as two SLM's. It features a rugged taut-band suspension meter, gold-plated attenuator switches and the same automatic shut-off capability as the DL-200 VS and 733C Super.

Sadelco Inc.

75 West Forest Ave.
Englewood, N.J. 07631
(201) 569-3323

Texscan Corp. makes a variety of signal level meters, including the Digitech 1 and Installer 3. The Installer 3, designed specifically for rugged environments, can be stored in temperatures ranging from -40 to +140° F and weighs approximately 5 lbs. The Digitech 1, which can be operated in either program or manual mode, is microprocessor-controlled and indicates frequency and level simultaneously. LCD heaters are automati-

for center frequency and for IF and RF attenuators and an automatic phase-locked local oscillator that stabilizes narrow band displays and minimizes residual noise sidebands.

Polarad Electronics

5 Delaware Drive
Lake Success, N.Y. 11402
(516) 328-1100

Tektronix Inc. manufactures a variety of spectrum analyzers, including the models 496P, 7L12 and 7L14 highlighted in the *CED* spectrum analyzer product profile. The 496P is a portable system; the 7L12 and 7L14 employ plug-in designs.

The 496P features automated signal tracking, which allows the analyzer to track drifting signals without assistance from the controller. The system's two-way communication ability permits real time comparisons of a controller generated spectrum, or set of limits, and an incoming signal. The 496P also can be programmed or used as a manual instrument.

The 7L14, for use in close-in and two-way communications measurements, has a digital storage section that allows waveforms to be compared simultaneously. A MAX HOLD function facilitates amplitude and frequency drift measurements, and an automatic phase lock component helps assure excellent stability. The 7L14 also uses an input limiter to provide automatic overload protection of the first mixer.

The Tektronix 7L12 has a 70 dB spurious-free display dynamic range, a 4:1 shape factor resolution bandwidth filter, fully-calibrated displays, a CRT readout of all important parameters and automatic phase lock. The system is for use in applications where the resolution, low-end coverage and digital storage of the 7L14 is not required.

Tektronix Inc.

P.O. Box 500
Beaverton, Ore. 97077
(503) 644-0161

Texscan Corp. manufactures a variety of spectrum analyzers for different frequency ranges and applications. The AL-55A covers the 0.4-450 MHz range and comes equipped with an internal calibrator and crystal controlled markers. The AL-51A covers the 4-1000 MHz range and includes a CRT display, built-in marker controls with phase lock, a digital storage option, selectable resolution setting, preset display controls, switchable and variable dispersion controls and an internal/external battery. The VSM-2A is a versatile, portable spectrum analyzer with 70 dB dynamic range. This range permits measurement of signal level, radiation, spurious and harmonic content, intermodulation, antenna orientation and headend stage gain.

Texscan Corp.

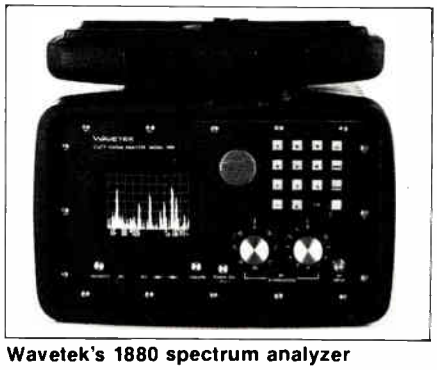
2446 North Shadeland Ave.
Indianapolis, Ind. 46219
(317) 357-8781

Texscan's Digitech 1

Wavetek's 1880 spectrum analyzer is a microprocessor control system, which can perform FCC compliance and routine measurements anywhere on the system. Two separate sections of the band can be viewed simultaneously and channels can be called up by converter number with the unit's direct keyboard entry. The 1880 is self-calibrating, can monitor its own battery level and the ambient operating temperature, offers preprogrammed channel selection and has automated test functions for the followign measurements: carrier-to-noise, hum modulation, FM deviation, cross-modulation and second and third order.

Wavetek Indiana Inc.

5808 Churchman
Beech Grove, Ind. 46107
(317) 787-3332


Wavetek's 1880 spectrum analyzer

See Pages 86 and 87 for Spectrum Analyzers Specifications Chart.

continued from page 74
video test signals and is the hardest to capture.

There are some uses for this display when used to determine distortion of envelope detectors of demodulators—similar to analysis of leading or trailing edge of the bar signal which has a shorter HAD. The accomplishment of this measurement will be the ultimate of accuracy that the two-control of the Z-axis module can accomplish.

The spectrum analyzer will only perform with 300 KHz or wider IF bandwidth. (See Figure 6.) The duration of the Z-axis pulse will have to be observed closely on the A-B presentation of the video waveform monitor because of the difference in propagation of the RF signal through the spectrum analyzer. The duration will appear to occur during the 12.5 T pulse due to the difference of propagation. There are color frequency test signals before and after the 2T pulse which could interfere if the delay and the duration are not properly set.

Phase canceling of the picture carrier to blanking level will allow presentation of only the sideband energy. The carrier canceling technique can be applied to any of the TSSA procedures.

Noise measurement

Although the noise of a television channel can be measured with a 30 KHz bandwidth IF, 300 KHz will measure the noise with greater resolution. Calibration can be achieved directly with this noise plot where the noise was introduced at different levels with -20, -40 and -50 dB below peak video output from the Tektronix 147 video signal generator. (See Figure 7.)

Normal propagation and processing will present very little difference in noise energy distribution. Poor signal processor alignment can be seen as well as the signature of a dual channel video recoder or a satellite earth station receiver.

When the video waveform monitor is on manual line select and placed on line 4 in the vertical sync pulse time, true peak video carrier can be recorded. Care must be exercised on these lines as incorrect timing will allow energy from nearby sync pulse to be recorded.

Other applications

Using the pulse from the Z-axis control unit and applying this pulse to control the output of a tracking signal generator, high level sweep of all the headend equipment can be made without interference to normal operation of a cable system. The applying of sweep signal during a blank line in the vertical interval makes this type of sweeping possible. Off-set frequency

continued on page 88

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Spectrum Analyzers

Co. Name and Model	Avantek CR-4000	ComSonics SA440B	Polarad 623C-1	Polarad 640C	Tektronix 496/496P	Tektronix 7L14
Frequency Range	5-440 MHz	0.5-440 MHz	100 KHz-2.0 GHz	3 MHz-40 GHz	1 KHz-1800 MHz	10 KHz-1.8 GHz
Frequency Accuracy	equal to accuracy of comb	± 4 4 MHz	± 5 MHz	± 5 MHz ± 1 count	± 5 MHz + 20% of span/div.	within 5% of the span selected
Residual FM	N/A	8 KHz P/P unlocked; 200 Hz P/P phaselocked	unstabilized, ≤ 10 KHz peak-to-peak; phase lock mode, ≤ 150 Hz peak-to-peak	Same as Polarad 623C-1	≤ 10 Hz (P-P) over 20 ms, phaselocked; ≤ 1 KHz (P-P) over 20 ms, not phaselocked	13 Hz (P-P), phaselocked; ± 10 KHz (P-P) for 20 ms, not phaselocked
Drift	N/A	N/A	± 5 KHz/10 min. after 1 hr operation	Same as Polarad 623C-1	330 Hz/10 min. after 1 hr phaselocked	2 KHz/hr phaselocked, 75 KHz/hr not phaselocked
Resolution	3 dB bandwidth, 200 KHz	four bandwidths: 1 MHz-3 dB bandwidth 1 MHz ± 100 KHz; 300 KHz-3 dB bandwidth 300 KHz ± 60 KHz, 30 KHz-3 dB bandwidth 30 KHz ± 3 KHz; 1 KHz-3 dB bandwidth 1 KHz to ± 1.5 KHz	automatic mode, resolution bandwidth tracked with frequency span; manual mode, switch selects 300 Hz-1 MHz resolution bandwidth	same as Polarad 623C-1 with an IF bandwidth range of 300 Hz-1 MHz at 3 dB bandwidth; 300 Hz, 1 KHz, 3 KHz, 10 KHz, 20 KHz, 300 KHz and 1 MHz; ± 20% accuracy	bandwidth (6 dB)-30 Hz, then 100 Hz to 1 MHz in decade steps, plus an AUTO position. Resolution is within 20% of selected bandwidth.	30 Hz-3 MHz, in decade steps
Noise Sidebands	10 dB max 8 dB typical	N/A	average level is 70 dB below CW signal, 60 KHz from signal	same as Polarad 623C-1	≤ 75 dBc at 30 times the resolution bandwidth offset from the center frequency	-70 dBc min. at frequency offsets ≥ 25 x resolution bandwidth settings
Amplitude Calibration	-10 dBmV at ±.1 dB over temperature	+20 dBmV ± 0.5 dB at 30 MHz	-30 dBm ± 0.5 dB at 100 MHz	same as Polarad 623C-1	N/A	N/A
Flatness	± 5 dB (reference to 40 MHz comb)	N/A	N/A	± 1.75 dB, .003-2.0 GHz	± 1.5 dB, 1 KHz-1800 MHz measured with ≥ 10 dB RF attenuation	± 1.5 dB, with respect to 50 MHz, over any selected frequency band
Harmonic Distortion	55 dB max., 65 dB typical	N/A	≥ -70 dB second harmonic, relative to fundamental rated at -30 dBm input to mixer	≤ -60 dB second harmonic, relative to fundamental rated at -40 dBm input to mixer	≤ -60 dBc for a full-screen signal	N/A
Intermodulation Distortion	55 dB max., 65 dB typical	> 72 dB below input signals for signal separation > 1 MHz	third order≥ -65 dB (rated for two equal -30 dBm input signals to mixer) and ≥ 300 KHz apart measured from Log Reference Level	third order: -65 dB (rated for two equal -40 dBm input signals to mixer) and > 300 KHz apart (1-mixing mode)	third order: down 70 dBc below any two on-screen signals	second order: 100 KHz -1.8 GHz; down 70 dB or more from two -40 dBmV signals; third order: 100 KHz -1.8 GHz, down 70 dB or more from two -30 dBmV signals
Sensitivity	-114 dBm -65 dBmV	N/A	> -120 dBm	-108 dBm	-85 dBm	-80 dBm
Impedance	75 ohms	75 ohms, return loss (no attenuation) 13 dB	50 ohm	50 ohm	50 ohms	50 ohms
Attenuation	35 dB in 5 dB steps	70 dB in 10 dB steps	N/A	N/A	calibrated in 10 dB steps	calibrated in 10 dB steps
Maximum Input Level	+ 68 dBmV max	+20 dBmV for full scale response (reference attenuator set to 20 dBmV)	+20 dBm incident on mixer; +30 dBm incident on RF attenuator, with ≥ 10 dB RF attenuation	+10 dBm incident on mixer; +30 dBm incident on RF attenuator, with ≥ 20 dB RF attenuation	+30 dBm	+30 dBm
Power	60 Hz 110/115 V 50 W nominal	N/A	115/230 volts; ± 10%, 50-60 Hz, 90 W	115/230 volts; ± 10%, 50-60 Hz, 180 W	210 watts max.; 3.2 amperes, at 115 V and 60 Hz	N/A
Temperature	operating -10° +120°F, charging +40°-+100°F	N/A	0-55°C	0-55°C	-15°C-+55°C, operating; -62°C-+75°C non-operating storage	N/A
Sweep Time	continuously variable from 20 Hz-1 KHz nominal	1.8 ms/scan-80 u sec/scan	2 ms/div.-2 sec/div. in ten calibrated steps (1:2:5 ratio)	2 ms/div.- 2 sec/div. in ten calibrated steps (1:2:5 ratio)	20 μs-5 s/div. in 1-2-5 sequence (10 s/div. in auto)	10 s/div. to 1 μs/div. in a 1-2-5 sequence

Tektronix 7L12	Texscan AI-55B	Texscan AI-51A	Texscan VSM-2A	Wavetek 1880
100 KHz -1.8 GHz	0.4-450 MHz	0.4-1000 MHz	4-1000 MHz	4-450MHz
± 10 MHz +1% of dial readout	± 2 MHz from 50°-90°C	± 10 MHz	± 10 MHz	± 100 KHz
200 Hz (P-P) when phaselocked; 20 KHz (P-P) max. in 5 sec. when not phaselocked	less than 10 KHz P-P	less than 20 KHz P-P; less than 500 Hz P-P phaselocked	less than 20 KHz P-P	< 5 KHz
within 50 KHz/hr phaselocked; within 100 KHz not phaselocked	phaselocked after 1 hr warmup: 10 KHz/min., 100 KHz/10 min.	phaselocked after 1 hr warmup: 10 KHz/min., 100 KHz/10 min.	phaselocked after 1 hr. warmup: 10 KHz/min., 100 KHz/10 min.	± 100 KHz
300 Hz-3 MHz, in decade steps.	3 dB bandwidth: 200 KHz, 10 KHz, 500 Hz, switch selectable	3 dB bandwidth: 200 KHz, 10 KHz, 500 Hz, switch selectable	3 dB bandwidth: 200 KHz, 10 KHz, 500 Hz, switch selectable	0.1 dB
N/A	more than 72 dB below CW signal level, 15 KHz or more away from signal	more than 60 dB down from an input signal, 15 KHz or more away from signal	more than 60 dB down from an input signal, 15 KHz or more away from signal	≤ -40 dBmV
N/A	54 MHz CW output -40 dBm ± 0.5 dB	54 MHz CW output -40 dBm ± 0.5 dB	54 MHz CW output +10 dBmV ± 0.5 dB	at any position in 1 dB steps ± 5dB over temperature
± 1.7 dB, with respect to 50 MHz, over any selected frequency band	with 10 dB input attenuation: ± 1 dB	with 10 dB input attenuation: ± 2 dB	with 10 dB input attenuation: ±2 dB	± .5 dB over temp.
N/A	third order: 60 dB down; second order: 50 dB down	third order: 60 dB down; second order: 50 dB down	third order: 60 dB down; second order: 50 dB down	-40 dB down, not applicable in many measurements
second order: down 70 dB or more from -40 dBm signals, within any frequency span; third order: down 70 dB or more from two -30 dBm signals, within any frequency span	two -40 dBm signals at any separation	two -40 dBm signals at any separation	two +10 dBmV; any separation	same as harmonic distortion
-80 dBm	N/A	N/A	N/A	full scale; +20 dBmV in 10 dB per division mode; full scale: 0 dBmV, 2 per dB division mode
50 ohms	50 ohms	50 ohms	75 ohms	75 ohms
calibrated in 10 dB steps	62 dB max. in 1, 2,3,6,10 and 20 dB steps	42 dB in 1 dB steps	42 dB in 1 dB steps	80 dB in 1 dB steps
30 dBm	N/A	N/A	N/A	+60 dBmV
N/A	external: +12 V-+15V DC at 1.5 amps; internal batteries: 3 hrs. operation	external: +12 V-15 V DC, 120/240 V, 50/60 Hz with charger; internal battery: 3 hrs. operation	external: +12 V-+15 V DC, 120/240 V, 50/60 Hz with charger; internal battery: 3 hrs. operation	battery charger/AC adapter for continuous 110/220 VAC, 50/60 cycle operation
N/A	operating range: 0° -110°F; storage: -30° -+140°F	operating range: 0° -110°F; storage: -30° -+140°F	operating range: 0° -110°F; storage: -30° - +140°F	-10-+120°F, -20-+50°C
10 ms/div.-1 μs/ div. provided in 1-2-5 sequence; variation is continuously provided between steps	0.3-3.0 Hz, continuously variable and manual	0.3-3.0 Hz, continuously variable and manual	0.3-3.0 Hz, continuously variable and manual	adaptive depending on scan

continued from page 84

can produce video sweep at baseband to test modulator at their output frequency.

TSSA of TV signals on FM carriers can be as revealing as TSSA at baseband frequencies. Microwave AM and FM signals can also be measured for many of their characteristics.

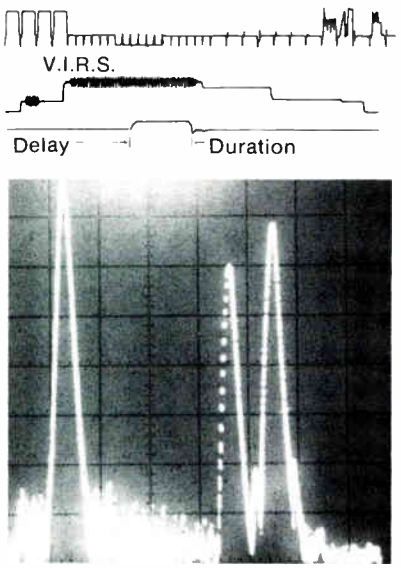
Summary

The time selective spectrum analysis, by using the Z-axis control module in conjunction with the video waveform monitor and spectrum analyzer, will allow considerable additional utility to the spectrum analyzer. Additional understanding will occur concerning the theory and operation of the modulation characteristics of radio frequency carriers.

There are many uses suggested in this paper which describe the minimum equipment that may be found in a cable system. With other equipment, such as a plotter, tracking generator and offset frequency generation, the utility will be even more greatly expanded.

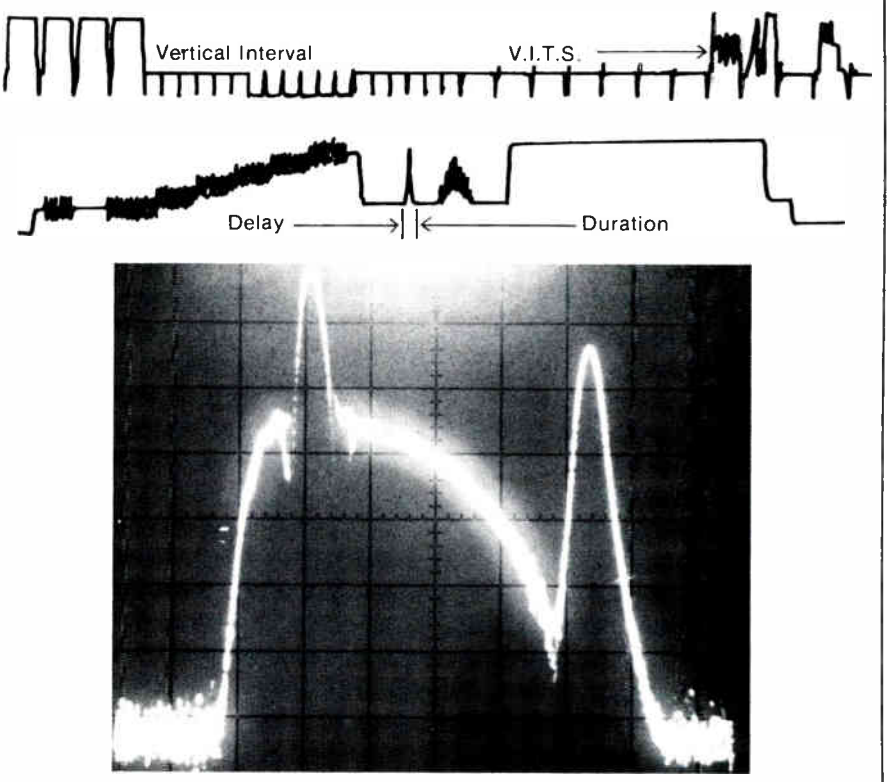
Figure 1. Functional Diagram: Time Selective Spectrum Analysis
Figure 2. Spurious Signals: 30 KHz IF Bandwidth 10 dB log the same time is selected for noise.
Figure 3. Picture Quality: 100 KHz IF Bandwidth 10 dB log.
Figure 4. RF Amplitude Response: 300 KHz IF Bandwidth 10 dB log.
Figure 5. Amplifier Linearity: 100 KHz IF Bandwidth, 10 dB log vertical.
Figure 6. 2T Response: 300 KHz IF Bandwidth, 10 dB log vertical.
Figure 7. Carrier-to-noise: 300 KHz IF Bandwidth, 10 dB log. CED

Figure 5



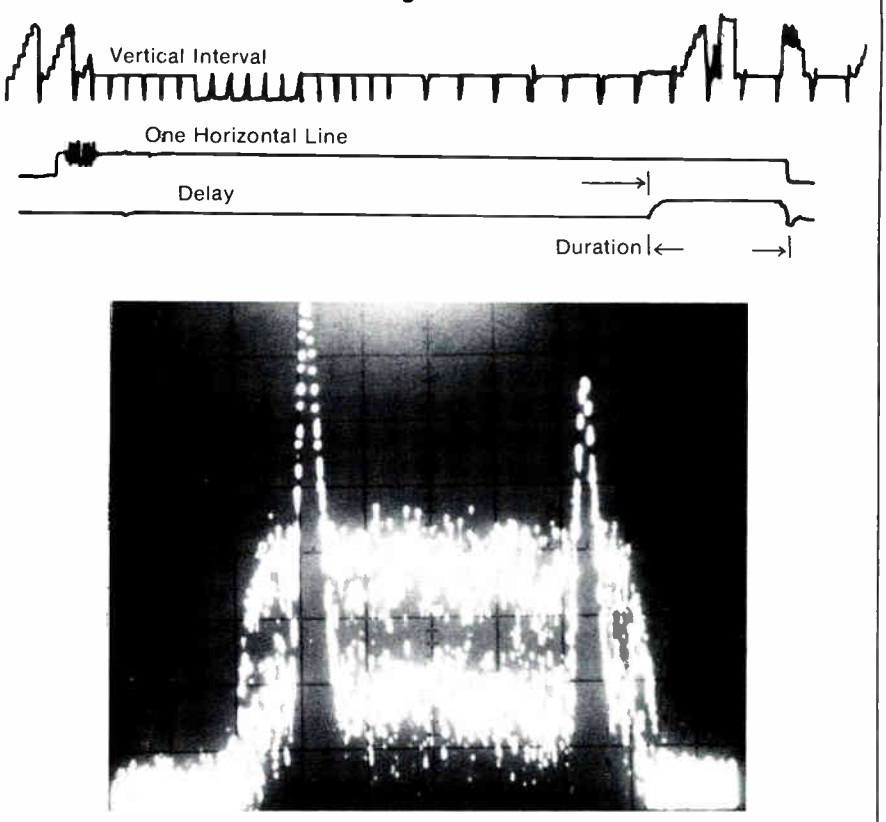
Amplifier Linearity - 100 KHz I.F. Bandwidth, 10 dB log vertical.

Figure 6



2T Response - 300 KHz I.F. Bandwidth, 10 dB log vertical.

Figure 7



Carrier to Noise - 300 KHz I.F. Bandwidth, 10 dB log.

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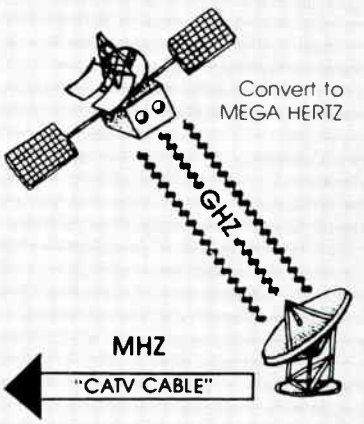

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Ad Index

People News

■ **Leader Instruments** has promoted **John White** to product marketing manager of its video and audio test instrument equipment. Prior to his promotion, White held a variety of engineering and marketing positions with the company. White also has served in other production and engineering capacities with Fairchild Weston Corp. and Sperry Gyroscope.

■ Recent personnel changes at **ComSonics Inc.** include the appointment of **Thomas Robinson** to vice president of finance, **Mark Barber** to equipment repair manager and **Linda Payne** to customer service representative. Robinson, appointed vice president of finance, previously served as director of finance for the company. In his new position, Robinson oversees ComSonics' day-to-day financial operations. Prior to joining ComSonics in 1981, Robinson was general manager for the Sierra Corp. Barber's appointment to equipment repair manager was a promotion from his former position as field technician. In his new post, Barber is in charge of equipment repair and for the company's service and repair technicians. As ComSonic's new customer service representative, Payne is responsible for handling inquiries on equipment repair and manufacturing operations.

■ **Michael Barker**, former director of manufacturing for Burroughs Corp.'s industry systems division, has been named director of operations analysis for **GTE Communications Products**. In his new position, Barker will report to GTE Communications Products' vice president of manufacturing and will be responsible for identifying major operational cost improvement opportunities and for overseeing implementation of these improvements on a worldwide basis.

■ **Texscan Corp.** has appointed **William Lipman** systems software manager. Lipman's responsibilities in this position include specification and development of software packages to support the company's CATV product lines. Lipman brings to this position previous experience as director of computer applications for Oak Communications System.

■ **Tribune-United**, a joint venture between Tribune Cable Communications Inc. and United Cable Television Corp., has appointed **John Schmuhl** vice president and general manager of the more than 200,000-home system yet to be constructed throughout Montgomery County, Md. Schmuhl brings to Tribune-United previous experience in both broadcast television and cable. He most recently served as president and general manager for the Warner Amex Qube system in Columbus, Ohio.

■ **Steve Hubbard** has joined **Tribune Cable Communications Inc.** as general manager of its Milwaukie, Ore., system. A former area manager of the Liberty Cable Television system in Newport, Ore., Hubbard also spent two years at Storer Cable Television's Laguna Beach, Calif., system. He holds a bachelor of arts degree in Telecommunications from Chico State University in Chico, Ga. **CED**

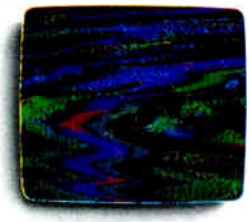
This section is provided as a service to our readers. If you would like changes in your company's personnel included, please send the appropriate correspondence to *CED*'s editorial staff in Denver.

CONGRATULATIONS ORION™ USERS — YOU'RE THE FIRST!

OAK MEDIA CORPORATION • BIZNET • SATELLITE TV PLC • CATHOLIC TELECOMMUNICATIONS NETWORK OF AMERICA • VIDEONET • CANADIAN SATELLITE COMMUNICATIONS, INC.

The first fully secure premium program channel to be transmitted by satellite in the U.S. became operational this year when, on March 1, Oak Media Corporation turned on its ORION Addressable Satellite Security System. Unlike any other U.S. premium satellite programming, Oak Media's ΘN TV transmissions can be received only by authorized subscribers.

ORION was introduced in early 1980 and was used to encode the first secure commercial satellite program transmission, the Ali-Holmes prizefight. Since then, ORION has been used for virtually every scrambled teleconferencing and *pay-per-view* satellite transmission, with ORION equipment provided by VideoNet, a full-service satellite seminar organization.



Unauthorized viewers receive no audio and see only a jumble of broken color bands.

Only authorized viewers equipped with an ORION decoder can recover the original television signal.

ORION was also first in Canada, where it was installed in late 1981 by Canadian Satellite Communications Inc. (CanCom). Today, CanCom is transmitting four separate program channels, all encoded by ORION, to bring television to viewers across rural Canada.

In March of 1982, ORION became the first satellite security system to be used in a commercial application in Europe, when Satellite Television PLC initiated entertainment program transmissions from London to affiliate cable systems and hotels in Norway, Switzerland, Malta and other European countries.

And ORION was also the first satellite security system to be used in an established private network, the BizNet subscription television service of the U.S. Chamber of Commerce. The Catholic Telecommunications Network of America will soon implement a similar ORION system for "narrowcast" programming to religious, educational and health care affiliates.

In short, ORION is the only field tested, fully proven satellite security system in use today.

ORION is designed to meet the optimal performance requirements of a commercial satellite security system. Analog video scrambling, combined with digital audio encryption, ensures transparent signal processing along with high level security. ORION's dynamic video scrambling totally obscures the picture, and the encrypted audio is virtually impossible to break, eliminating the potential for exploitation of stolen signals.

ORION's addressability feature enables the satellite uplink operator to authorize any decoder to receive any—or none—of up to 49 different categories of programming. All addressing and control information, along with the digitized, encrypted audio, is contained within the video signal, leaving subcarriers free to carry additional information such as radio programs.

Other products currently under development at Oak include multi-channel audio, an integrated receiver-decoder for direct-to-home applications, and other custom-designed features to meet specialized customer requirements.

ORION is currently in full scale production to meet current customer demand. Over a thousand decoders are in use today, and nine thousand more will be delivered before the end of the year.

The costs of unauthorized signal reception are high—the loss of revenue by program suppliers and the misuse of sensitive business information. A proven solution is available today. ORION. For a detailed technical description, or to arrange for a demonstration, call or write:

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In Orbit

Satcom 3R

Signal	Day	Start/Stop	Alert Tone	Transponder
ACSN-The Learning Channel	Weekdays Weekends	6 a.m./4 p.m. 6 a.m./1 p.m.	192°/#	**16**
ARTS	Daily	9 p.m./12 a.m.	311°/# (E,C,M) 519°/#(P)	**1**
Cable Health Network		24 hrs.	361°/#	**17**
CBN		24 hrs.	None	**8**
Cinemax		24 hrs.	None	**20 (E,C) 23 (M,P)**
CNN		24 hrs.	024°/#	**14**
CNN Headline News		24 hrs.	635°/# 541°/#	**15**
C-SPAN		24 hrs.	None	**19**
Daytime	Weekdays	1 p.m./5 p.m.	307°/#	**22**
ESPN		24 hrs.	048°/#	**7**
Eternal World Television Network	Daily	8 p.m./12 p.m.	762°/#	**18**
HBO	Daily	24 hrs.	None	**24 (E,C), 13 (M,P), 22**
HTN Plus	Daily	4 p.m./4 a.m.	207°/#	**16**
Modern Satellite Network	Weekdays	10 a.m./1 p.m.	243°/# 421°/#	**22**
The Movie Channel		24 hrs.	None	**5**
MTV: Music Television		24 hrs.	None	**11**
National Jewish Television Network	Sundays	1 p.m./4 p.m.	None	**16**
Nickelodeon	Daily	8 a.m./9 p.m.	311°/# (E,M,C) 519°/# (P)	**1**
PTL		24 hrs.	None	**2**
Reuters	Weekdays	4 a.m./8 p.m.	None	**18**
Showtime		24 hrs.	576°/#	**12 (E,C) 10 (M,P)**
Spotlight		24 hrs.	None	**4**
USA Blackout Network*		Varies	295° 601°/#	**22**
USA Cable Network		24 hrs.	601°/#	**9**
WGN		24 hrs.	None	**3**
WTBS		24 hrs.	None	**6**
The Weather Channel		24 hrs.	None	**21**

Major Communications Satellites Serving North America

Location: Degrees West Longitude	Satellite	
	Present	**Future**
Location	Present	Future
67		Satcom-2R (Aug. 83)
69		Spacenet 2 (Sept. 84)
74		Galaxy 2 (Sept. 83)
76	Telstar 1 (July 83)	
79	Westar 2	
83	Satcom-4	
87	Comstar D3	
88.5		Telstar 3 (1985)
91	Westar 3	Spacenet 3 (Feb. 85)
94	SBS-3**	
95	Comstar D2 & D1	
96		Telstar 2 (1984)
97	SBS-2*	
99	Westar 4	
100	SBS-1*	
103		GTE-1 (1984)
104.5	Anik D-1	
106		GTE-2 (1984)
108.5		Anik C-1 (1984)
109	Anik B	Anik D-2 (1984)
112.5	Anik C-2	
114	Anik A-3	
117.5	Anik C-3	
119	Satcom-2	
122		Spacenet I (May 84)
123	Westar-5	
127	Comstar D4	
131	Satcom 3R	
134	Galaxy 1	
136	Satcom 1	
139	Satcom 1R	
143	Satcom 5	

Orbital slots and launch dates often change without notice

Satcom 4

Signal	Day	Start/Stop	Alert Tone	Transponder
BizNet	Weekdays	7 a.m./2 p.m.	None	**15**
Bravo	Daily	8 p.m./6 a.m.	None	**6**
Eros	Thurs-Sat	11 p.m./2 a.m.	None	**1**
FNN: Financial News Network	Weekdays	7 a.m./7 p.m.	975°/# 738°/#	**2**
GalaVision	Weekdays Weekends	4 p.m./4 a.m. 24 hrs.	None	**23**
National Christian Network	Daily	24 hrs.	073°/#	**7**
The Playboy Channel	Daily	8 p.m./6 a.m.	None	**12**
SIN		24 hrs.	819°/#	**1**
SPN		24 hrs.	429°/#	**3**
Trinity Broadcasting Network		24 hrs.	None	**17**

Westar 5

Signal	Day	Start/Stop	Alert Tone	Transponder
ARTS	Daily	9 p.m./12 p.m.	None	**12D**
BET	Daily	8 p.m./2 a.m.	406°/#	**12X**
Daytime	Daily	1 p.m./9p.m.	307°/#	**12D**
Satellite News Channel		24 hrs.	None	**4X, 6D 7X, 8X, 9X**
SelecTV		24 hrs	None	**3D**
Spotlight		24 hrs	None	**11D**
The American Network	Daily	5 p.m./5 a.m.	None	**10X**
The Disney Channel	Daily	7 a.m./11 p.m.	None	**6X(E,C) 5X(M,P)**
The Nashville Network	Daily	9 a.m./3 a.m.	866°/# 674°/#	**9D**
WOR		24 hrs.	None	**2D**

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

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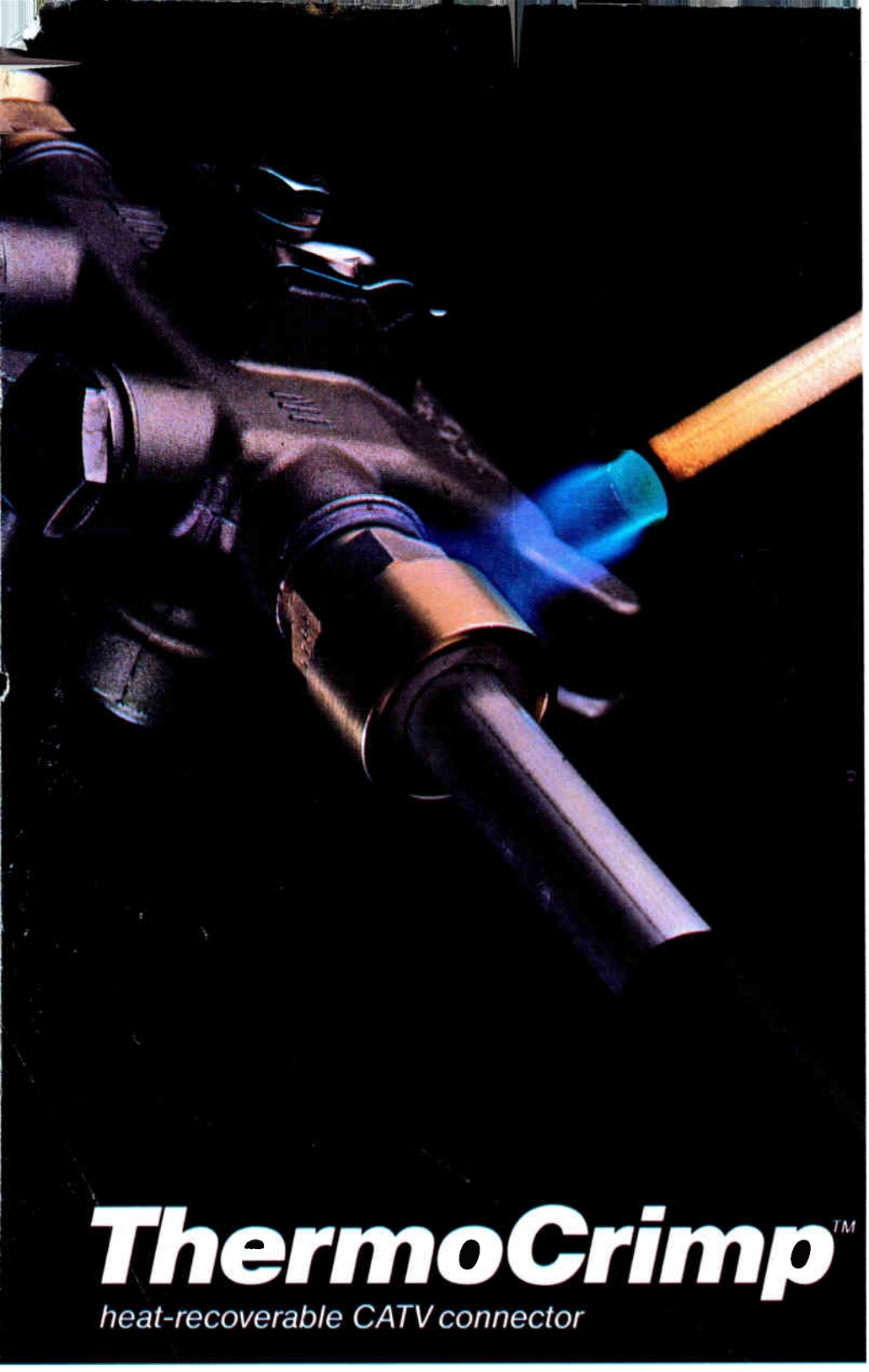

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