

# CED<sup>TM</sup>

NCTA Convention  
Technology Review

Communications Engineering Digest/The Magazine of Broadband Technology

June 1982

## In This Issue:

- Proper Grounding
- Return Path Noise



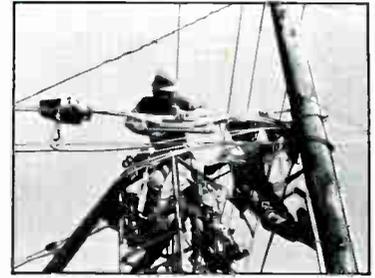
## No Loose Ends—Part I

- Tests And Measurements  
With The Spectrum Analyzer

CDFA58105MCC522 05/31/80/1  
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# Jackson tools

## 2 year warranty

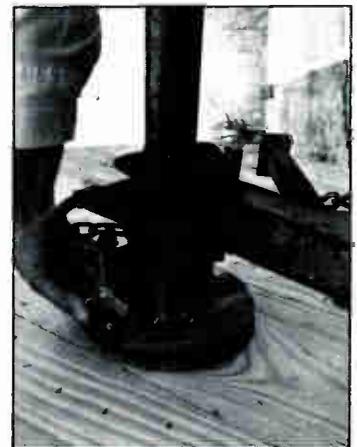


The name **Jackson** has always meant quality in cable construction tools. We stand behind this claim. Every tool shipped from Jackson Enterprises is backed by a **Two Year** limited warranty against factory defects in material and workmanship. We will be introducing several new tools dur-

ing the balance of '82, each designed for the demands of today's construction industry. Call or write for more information, or contact your local distributor. With Jackson Tools, you get the quality you expect.



New Lexan single roller #JP-3; greater strength at a lower cost.



Shown above: #1010 Trailer, #1078 Reel Brake, #1019 90° Corner Block, #1084-0 Double Bender.

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**We're proving it every day.** Proving it with Magna 440 systems up and operating, and in our Magnavox Mobile Training Centers.

We're proving it to cable-system operators everywhere. We're showing them how Magna 440 components—mainstation amplifiers, digital system sentry-status monitoring system, line extenders, directional taps, couplers, connectors and subscriber passives—are all engineered for full 440-MHz, 64-channel performance.

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We're proving how Magna 440 systems' modular design can save on installation costs and labor by eliminating adapters and field modifications. And we're proving how dependable Magna 440 performance means less maintenance, more profits.

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If you have been holding off, waiting to see where system equipment was heading, wait no longer. The future of cable-TV system equipment is here now in Magna 440, and it works.

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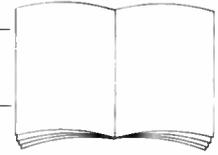
#PL-CL-200 CAP-LOC™, a pilfer-resistant Ultra-Violet stabilized plastic housing, unaffected by heat or ultra-violet rays, that encloses cable connectors and is ideal for use as a drop lock at TV hook-up, splitter lock, weather boot using RTV, and also as a splice cover lock. Available in 6 colors (Ivory, Red, Blue, Green, Yellow, and Black). CAP-LOC™ also functions as an excellent color-coded audit tag method, providing 21 color-code combinations. (Specify color when ordering).

#PL-CL-100 PILFER RESISTANT TV OUTLET consists of one CAP-LOC™ set and specially designed Wall Plate with four rectangular holes through which the CAP-LOC™ is engaged.

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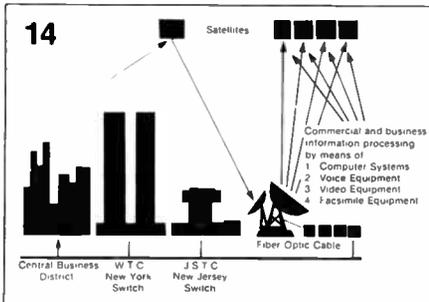
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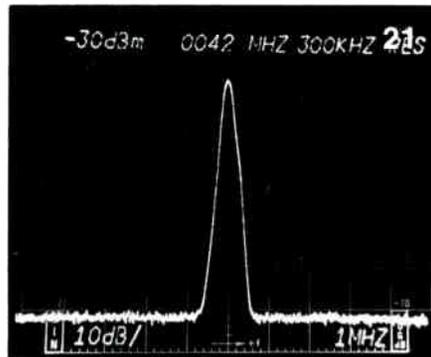
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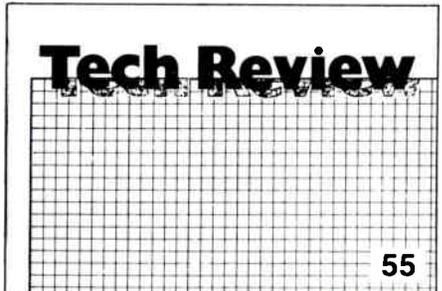
The first installment in a four part series, this article, compiled by Tektronix Inc. engineers, deals with techniques for the best and most thorough use of the spectrum analyzer for laboratory quality CATV tests and measurements, proof-of-performance and system maintenance.

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### About The Cover:

The bench technician on the cover is making FM deviation measurements with a spectrum analyzer. Photo courtesy of Tektronix Inc.



**NEVER BEFORE HAS  
THIS VITAL  
COMPONENT BEEN SO  
SUCCESSFULLY  
INTEGRATED INTO A  
1" VIDEO RECORDER.**



**SONY INTRODUCES A 1" VIDEO RECORDER TAILORED TO THE PEOPLE WHO USE IT: THE BVH-2000.**

Because Sony probably has more experience selling and servicing 1" VTR's than anyone else, we're in an unequalled position to understand the wishes of 1" video users.

And now, Sony announces with fulfillment for the broadcast industry: the new BVH-2000 1" video recorder.

**WHY "BVH-2000" WILL MEAN DIFFERENT THINGS TO DIFFERENT PEOPLE.**

In broadcast recording, there is no such thing as one typical situation.

That's why there's no one single BVH-2000.

The BVH-2000 actually allows you to "design" the VTR you need for your own particular applications and budget.

You can choose among three different control panels—ranging from a basic model to one with virtually every possible feature and function.

And the tape transport system, signal system, and control section can either be combined into a single unit, or separated easily and installed in a 19" rack or console.

The BVH-2000 also gives you far greater latitude in setting up your entire recording system. Various remote-control connectors enable you to interface your system in a variety of ways for studio, mobile, and editing configurations. Direct interface with U-matic<sup>®</sup> and Betacam<sup>™</sup> is possible, too. The BVH-2000

also has an optional plug-in time base corrector.

What's more, the BVH-2000's lighter weight and smaller size (almost 50% less than its predecessor) make it as ideal on the road as it is in the studio.

And because of the ever-increasing number of applications requiring longer program times, the BVH-2000 provides up to 2 hours of tape time.

**A VTR THAT LEADS THE SIMPLE LIFE.**

In the BVH-2000, unlike most other VTR's, microprocessors are used to their full advantage. All data necessary for servo control are channeled into a central processing unit, making the operator's control over all systems and functions simpler and more precise.

Life is made simpler yet by the fact that every necessary function control, metering facility, and electronic module is accessible from the front.

Even the way the tape moves through the recorder has been simplified. One innovation—an extremely precise servo mechanism



The BVH-2000 (shown with Type-III control panel).

—permits the entrance and exit guide posts to move about 10mm away from the drum during threading. The result is the easiest threading system ever in a 1" video recorder.

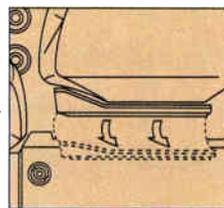
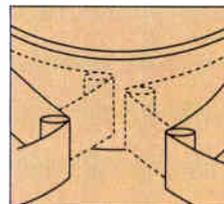
**THE MOST ARTICULATE VTR EVER BUILT.**

The BVH-2000 removes much of the mystery from maintenance, too. It literally tells you about malfunctions—usually well before you'd notice them yourself—through a microprocessor-governed self-diagnostic system.

The system includes various alarm functions and numerous checks to confirm that everything is working properly.

Most defects can be easily found—allowing for far less complicated maintenance and repairs, and reducing downtime considerably.

And because the best way



To simplify threading, guide posts automatically move away from drum, and audio head cover opens.

to simplify maintenance is by lessening the need for it, the Sony BVH-2000 has been designed to be virtually maintenance-free down to the last detail.

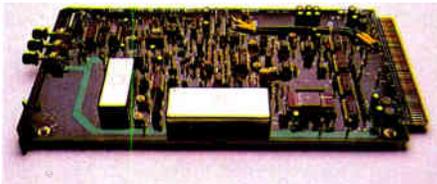
For example, only brushless DC motors are used, and all incandescent lamps have been replaced with high-brightness LED's.

Other welcome advances include a greatly expanded dynamic tracking range (from reverse at normal speed to forward at 3 times normal); programmed play (allowing you to vary playback speed across a range of  $\pm 20\%$  of normal speed); and video and audio confidence.

Remarkably, these are only some of the Sony BVH-2000's innovations. All of them add up to form the answer to virtually every need ever expressed by the users of 1" video.



Display board for self-diagnostics and other data-processing functions.



Plug-in time base corrector (optional).



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To find out how it can answer yours, write Sony Broadcast, 9 West 57th St., New York, NY 10019. Or call us in New York/New Jersey at (201) 368-5085; in Chicago at (312) 860-7800; in Los Angeles at (213) 537-4300; in Atlanta at (404) 451-7671; or in Dallas at (214) 659-3600.

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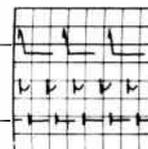
The S.A.F.E. is a Secure Access-Free Enclosure designed to stop pay TV theft. To bar intruders, each S.A.F.E. has a built-in maximum security locking system. Heavy-gauge steel and flange free construction are standard security features on the S.A.F.E.

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## Fiber Optic Project Awarded

The FCC has authorized AT&T and eight affiliated companies to complete construction of and operate a fiber optic cable system for telephone service between Washington, D.C. and Cambridge, Massachusetts. The commission allowed AT&T to amend its original application to include areas between New York City, Cambridge, Moseley, Virginia and Washington, D.C. within its Northeast Corridor Project, despite objections raised by a Japanese competitor. When AT&T first announced the fiber optic plan in 1980, it selected Western Electric as the lowest cost domestic lightguide system supplier. The Japanese firm Fujitsu objected, stating that the selection violated several trade agreements and was inconsistent with the Communications Act (Sec. 214) since Western Electric's bid was not the lowest. U.S. agencies determined that AT&T was not bound to the treaties Fujitsu cited. Fears that AT&T's reliance on Western Electric would adversely affect ratepayers were allayed by Western's commitment to procure 100 megameters of fiber from outside sources over the next three years.

## Have Dish Will Conference

The videoconferencing arena seems to be getting more and more crowded these days. The latest competitor: Western Union and Netcom International of San Francisco. The two companies are planning a joint venture in which Western Union will supply the satellite time and Netcom will package and market the teleconferences.

## More On "Wireless Cable"

Microband Corporation recently filed additional information with the FCC regarding its plan for a "wireless cable system." Microband cited economic and viewer preference information which, according to the company, indicates that if the MDS industry is to survive it must become a true competitor to cable television in major markets. That could be accomplished, Microband said, with three multichannel MDS licensees in each of the largest markets. Microband's own proposal would involve reallocating three groups of four channels from the Instructional Television Fixed Service to MDS in the 50 largest metropolitan areas. Microband's system, called Urbanet, would offer pay TV, teletext, two-way interactive and other services. The company submitted its comments in favor of a proposed rulemaking which will use the 2500-2690 band more efficiently and set new MDS technical rules.

## Microwave Death

Those working in the growing field of microwave technology may wish to note this sobering story. The Appellate Division of the New York Supreme Court recently ruled that a telephone technician's 13-year exposure to microwave radiation was enough to cause his death and entitle his widow to compensation. The associated Press reported that Antoinette Yannon, who worked for 13 years at a telephone company microwave installation in the Empire State Building, suffered "a drastic deterioration" of his sight, hearing and coordination

and eventually died in 1974 from an unspecified "degenerative central nervous system disease" according to court records. There were conflicting views over the amount of radiation Yannon was exposed to and whether it exceeded permissible levels. AP has reported the court pointed to testimony that, even at permissible levels, "exposure over a prolonged period of time could produce harmful effects."

## BOCs As Operators

Local Bell operating companies may well become serious competition for the cable industry, according to a recently released study by the Boston-based Yankee group. Taking an opposing view to that of many observers who believe AT&T got the most benefit from its antitrust settlement with the most profitable operation, the Yankee group maintains the BOCs, "once unleashed from the parent company, may emerge as surprise winners in the communications sweepstakes and become the major competitive threat to the cable TV industry."

"To do so," the report claimed, "the ex-Bell operating companies will construct high-bandwidth channels in the nation's largest markets. This "rewiring of America" will eventually bring an integrated two-way voice, video and data channel into every home and business.

## Effects Pending

Reaction stemming from the NCTA convention indicated that cable systems have yet to feel a major impact from master antenna systems. Certain markets have already been hit by the competition, notably Dallas, Houston and Manhattan, but, apparently, MATV owners have just scratched the surface. However, one speaker on the panel "Apartments/Condos: Where Cable Challenges Dwell" stated that there actually is an "uneasy alliance" between cable and MATV, primarily because MATV can establish an awareness of cable in areas that have not yet been franchised. Yet, this doesn't appear to be the case pending in the Bronx, New York. With Cablevision Systems wavering in its proposal to wire the entire borough, a housing complex, Co-op City, has announced that it hopes to install its own 101-channel MATV system to serve its 15,000 units. If other housing communities follow the lead of Co-op City, the more lucrative neighborhoods may never be available to Cablevision. If this trend develops on a nationwide basis, cable companies may lose the incentive to wire the inner cities, where there is less potential revenue.

## Pay Up North

General agreement among Canadian Cable Television Association members and the new pay TV licensees for Canada has brought a recommendation that negotiations be pursued with Telesat Canada and the Canadian Radiotelevision Telecommunications Commission in order to have the agency's U.S. customers moved from Anik C-3 to Anik C-2. This would make Anik C-3 available to pay distributors for a Jan. 15, 1983, service date. The Canadian pay licensees have tentatively set a common market launch date of Feb. 1, 1983.

# CABLE OPERATORS:

## Ask your Satellite Program Suppliers about scrambling their satellite signals to attract and retain more subscribers.

Satellite signal pirates are on the increase, and no wonder! In return for what is today a moderate investment, a TVRO yields a superabundance of premium quality television programming. For the local cable television operator, the likely result of each new private TVRO installation is another non-subscriber home passed . . . a serious problem becoming more so every passing day.

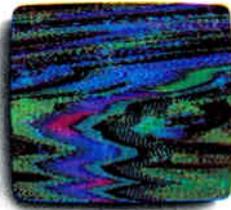
The revenue siphoned from cable systems by satellite signal pirates has already reached enormous proportions. Estimates indicate that approximately 25,000 private TVRO's are now in operation, and this number will increase nearly tenfold by year end 1985. Put another way, for every TVRO owned by cable operators, there are now five private TVRO's. In 1985 the ratio will be 50 private terminals for every cable TVRO.

This ratio is amplified by the fact that approximately ten percent of the private TVRO's are owned by MATV operators and other entrepreneurs who make a profit by distributing pirated programming to dozens or hundreds of viewers in multiple unit dwellings.

In terms of hard cash, the market value of a wired community is about \$1000 per home. Anticipated annual revenue, including the charge for a premium channel, is about \$250 per subscriber. Multiply that by the number of viewers taking signals from private TVRO's in the area to come up with the loss for any particular cable operator.

These figures do not include the loss of revenues resulting from missed pay-per-view opportunities—not only super-premium sporting events, but concerts and other "block-buster" specials. Recent prize fights, for example, have been delivered by cable at a charge of up to \$15 per subscriber. Pay-per-view events have also produced extraordinary results in attracting new subscribers. Such programming is usually available only via secure networks where program delivery can be tightly controlled.

Then consider that the cost to a cable operator to receive an encrypted satellite signal equates to about the same capital investment as a single wired home. The conversion of just one potential pirate to a subscriber produces more than enough revenue to justify secure satellite transmissions. The revenues from a single pay-per-view event could



*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.*



*Who on earth is listening in? With Oak's ORION Satellite Security System, it's up to you.*



*ORION is fully operational having been field-proven in a number of commercial and experimental operations. The encryption process is essentially transparent to meet or exceed EIA RS-250B performance standards. Versions are currently available to meet NTSC as well as CCIR video standards.*

pay for a satellite security system many times over. The solution is here today. ORION™. The Satellite Signal Security System from Oak, the world leader in satellite, CATV and STV signal encryption. For a detailed technical description and a special report on private TVRO proliferation, call or write today:

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**Systems**  
**Division**

# Seminars



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## June

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**10-12:** The **Montana Cable Television Association** annual meeting will be held at the Sheraton Hotel in Great Falls. Contact Tom Glendenning, (406) 586-1837.

**10-13:** The first portion of 1982 National Video Festival, presented by **The American Film Institute** and **Sony Video Products Company**, will be held at the Kennedy Center in Washington, D.C. Contact Sue Donoghue or Patty Prendergast, (202) 828-4040.

**13-15:** The 1982 convention of **The MDS Association Inc.** will be held at the Washington Hilton in Washington, D.C. Contact Christina Selin, (914) 576-6622.

**13-15:** The annual convention of **Oregon Cable Television Association** will be held at the Red Lion Hotel in Pendleton. Contact Mike Dewey, (503) 362-8838.

**21-25:** A **Community Antenna Television Association** advanced technical training seminar will be held at the Best Western Colonial Inn in Austin, Texas. For more information call the CATA Engineering Office, (305) 562-7847.

**24-27:** The second portion of the 1982 National Video Festival, presented by **The American Film Institute** and **Sony Video Products Company**, will be held at the AFI campus in Hollywood, California.

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## July

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**3-6:** CCOS-82, the **Community Antenna Television Association** annual convention, will be held at the Opryland Hotel in Nashville, Tenn. Contact Celeste Rule, (405) 947-7664.

**9:** **Introduction to Digital Electronics Workshop** taught by Joseph J. Carr, at the Baltimore Inner Harbor Hyatt Regency Hotel.

**14-17:** The **Florida Cable Television Association's** Annual Convention will be held July 14-17, 1982 at the Dutch Inn, Lake Buena Vista, Florida. For more information contact the FCTA, (813) 688-3787.

**14-17:** The **Mississippi Cable TV Association's** annual convention will be held at the Royal D'Iberville Hotel, Biloxi, Miss. Contact Susan Watts, (601) 266-4189; or Geary Stills, (601) 442-5418.

**19-21:** The annual convention of the **Cable Television Administration and Marketing Society**, "CTAM '82: The Winds of Change," will be held at the Hyatt Regency in Chicago. Contact CTAM, (202) 296-4219.

**21:** The summer conference of the **New England Cable Television Association** will be held at the Sheraton-Tara in Nashua, N.H. Contact Gary Cain, (603) 224-3373.

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## August

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**2-4:** A **Community Antenna Television Association** basic technical seminar will be held in Boise, Idaho. Contact the CATA Engineering Office, (305) 562-7847.

**4-6:** **Magnavox CATV Systems** will be conducting a field training seminar with its Mobile Training Center in Syracuse, N.Y. Contact Larry Richards, (315) 682-9105.

**8-9:** **Magnavox CATV Systems** will be conducting a field training seminar with its Mobile Training Center in Syracuse, N.Y. Contact Larry Richards, (315) 682-9105.

**11-13:** The fourth annual Satellite Communications Users

Conference, sponsored by **Satellite Communications** magazine, will be held at the Regency Hotel in Denver. Contact Anthony Chiaviello, (303) 694-1522.

**18-20:** The 1982 convention of the **Rocky Mountain Cable Television Association** will be held at the Hilton Inn, Albuquerque, N.M. Contact Oscar Davis, (505) 538-3701; or Ray Polvadore, (505) 867-4444.

**22-24:** The summer conference of the **Michigan Cable Television Association** will be held at the Hilton Hotel in Traverse City. Contact Sandra Applegate, (313) 235-6112.

**30-September 3:** A **Community Antenna Television Association** advanced technical seminar will be held in Phoenix, Arizona. Contact the CATA Engineering Office, (305) 562-7847.

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## September

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**9-11:** The annual convention of the **Southern Cable Television Association**, the Eastern Show, will be held at the Georgia World Congress Center in Atlanta. Contact Nancy Horne, (404) 237-8228.

**13-15:** The annual fall convention of the **Wisconsin Cable Communications Association** will be held at the Concourse Hotel, Madison, Wis. Contact Tim Hanson or Lynne Walrath, (608)256-5299.

**15-17:** **Magnavox CATV Systems** will be conducting a field training seminar with its Mobile Training Center in Boston. Contact Larry Richards, (315) 682-9105.

**15-17:** The sixth international fiber optics and communications exposition, **FOC '82**, will be held at the Los Angeles Marriott Hotel. Contact Information Gatekeepers, (671) 739-2022.

**19-22:** The **Pacific Northwest Cable Communication Association** annual convention will be held at the Sea-Tac Red Lion Inn, Seattle. Contact Douglas Rice, (406) 245-3051.

**20-22:** **Magnavox CATV Systems** will be conducting a field training seminar with its Mobile Training Center in Boston. Contact Larry Richards, (315) 682-9105.

**20-23:** The annual convention of the **New England Cable Television Association** will be held at Dunfey-Hyannis Hotel in Hyannis, Mass. Contact Gary Cain, (603) 224-3373.

**20-24:** **The International Symposium on Subscriber Loops and Services** will be held at the Toronto Hilton Harbour Castle Convention Centre, Toronto, Ontario. For more information contact Douglas Peck at (416) 599-6840.

**23-25:** **Magnavox CATV Systems** will be conducting a field training seminar with its Mobile Training Center in Boston. Contact Larry Richards, (315) 682-9105.

**27-29:** The annual convention of the **Minnesota Cable Communications Association** will be held at the Radisson South Hotel in Bloomington. Contact Mike Martin, (612) 861-1166.

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## Looking ahead

**October 10-12:** SCTE Fall Engineering Conference, Don Caesar Beach Resort Hotel, St. Petersburg, Florida.

**October 19-21:** Mid-America Cable TV Association Convention, Excelsior Hotel, Tulsa, Oklahoma.

**October 22-24:** National Association of MDS Service Companies (NAMSCO) Convention, Sheraton Hotel, Washington, D.C.

**October 26-28:** Atlantic Cable Show, Bally Park Place, Del Webb's Claridge and Brighton Hotels, Atlantic City, New Jersey.

**November 17-19:** Western Cable Show, Anaheim Convention Center, Anaheim, California.

**February 2-4:** Texas Show, San Antonio Convention Center.



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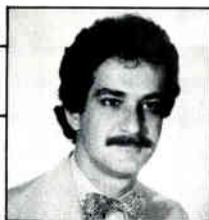
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card this issue for more information.



In the May issue of **CED** I offered a suggestion that might go some distance toward easing the drastic shortage of well trained personnel for the CATV industry. I pointed to the ranks of telephone engineers and suggested that the CATV industry might want to draw on that as a source of future manpower.

Jim Palmer, president of C-COR Electronics, has offered another solution to the engineering manpower shortage. Jim recommends that privately established trust funds for professorships or chairs, might enable major universities to handle a greater volume of technical students, and offer competitive salaries to professional academicians.

I would like to share part of Jim's letter to cable operators, entitled, "Commentary And Thoughts Ventured," with the readers of **CED**.

*What can we do about it (the manpower problem)? One approach is to fund a fellowship, internship or chair. Income from such funding could be used for incremental assistance for instructor, assistant/associate professor and full professor positions. For example, at one university, a \$25,000 permanent trust would provide the annual increment necessary to attract an outstanding instructor; income from a \$100,000 trust would fund the increment for an assistant or associate professor; whereas a \$750,000 to \$1,000,000 trust could totally fund (not incrementally) a full professor position. For example, the George Westinghouse Professor for Engineering Education chair, funded by Westinghouse, was established at Penn State in the mid-1950's.*

*Another method of assisting in the educational process, which in turn reaps direct benefits for us, is the funding of cooperative research at colleges and universities. Benefits derived from such a move include usable results from the research itself (not always a foregone conclusion, however), acquaintances established with faculty, staff and facilities of the educational institution and the establishment of a relationship with students which could lead to future hires to meet your engineering requirements.*

*Here at C-COR we have established summer internships for engineering students. We have recently clarified these to be "off-term" internships instead of summer. We could care less whether it is the summer term, winter, fall or spring that the student spends with us. We have*

*hired, and expect to continue to hire, some of those students who have participated in the internships here. As an added benefit, we are gaining valuable, productive work from them while they are with us. C-COR will soon fund a research project that will support an outstanding graduate student (and possibly a professor) at The Pennsylvania State University. A two-fold advantage is the productive output of the graduate student as well as C-COR's interaction with the student's professor-advisor. Finally, my wife and I have established the Palmer Faculty Fellowship in Electrical Engineering at The Pennsylvania State University this year and anticipate setting up something similar at Iowa State University next year.*

*Cooperative efforts outlined herein are easy to establish. The funds required are well within the means of many companies and individuals in this industry. Other benefits not already pointed out include the personal gratification gained from assisting society as a whole and the cost effectiveness on the bottom line. I might add that similar cooperative efforts can be established with institutions who offer two-year programs for associate degrees and with vo-tech schools.*

*One pitfall that I have seen in the cable television industry thinking, and I've said this many, many times over the past 25 years, is the desire for "CATV engineers." We need to recognize that what we really need are competent, technical people well-trained in their particular field. If they have a good foundation in the basics, the cable television industry can easily train them to work in a more specialized environment. Let's recognize the significant part we can play in building the foundation first.*

*George Sell*

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## Teleport To Be Built On Staten Island

STATEN ISLAND, NEW YORK—New York and New Jersey businesses operating in an electronic communications environment will soon have access to world business communications through a Teleport Satellite Communication Center to be built on Staten Island. The teleport will operate as an electronic "port of commerce." It will provide gateway access to satellite communications for any number of user/clients and will be linked with the New York and New Jersey business hubs by a 50 strand fiber optic cable stretching from the Staten Island Industrial Park to Journal Square in Jersey City and on to the World Trade Center in Manhattan. Group breaking should take place this summer with initial service launching during the first half of 1983.

Merrill Lynch & Co. will act as the Teleport's communications manager. Minimum technical provisions for the Teleport's Communications facilities will include the fiber optic trunk, up to ten 11-meter earth station slips, a control center, customer interface equipment, operations and maintenance services and nodal switching.

The Port Authority of New York and New Jersey has joined in a partnership

with Merrill Lynch & Co. to develop, build and operate the Teleport. According to Guy F. Tozzoli, director of world trade for the Port Authority of New York and New Jersey, Merrill Lynch was chosen because its communications needs coincided most closely with the port authority's plans.

The site of the Staten Island Industrial Park was chosen because it is government property and is outside the radiofrequency interference and congestion of the major business districts of the region. Antennas at the site will be shielded by an earthen berm for added reduction of interference.

The Port Authority's plans call for a 400-acre site for three buildings in a "park-like environment, similar to a suburban office complex." According to the Teleport's general manager, Robert E. Catlin, the Port Authority's board of directors is likely to approve funding for the project in June. The project's first 11-month stage of construction may cost \$120 million and completion may take 10 years, divided into two five-year phases. The estimates for the fiber optic link and earth station antennas range from \$10 million to \$30 million.

Approval from the Staten Island Borough Hall is being shepherded through with the blessings of Borough president Anthony Gaeta who told a gathering of the project's sponsors, "You certainly have my support."

## COMSAT Project Gets FCC Nod

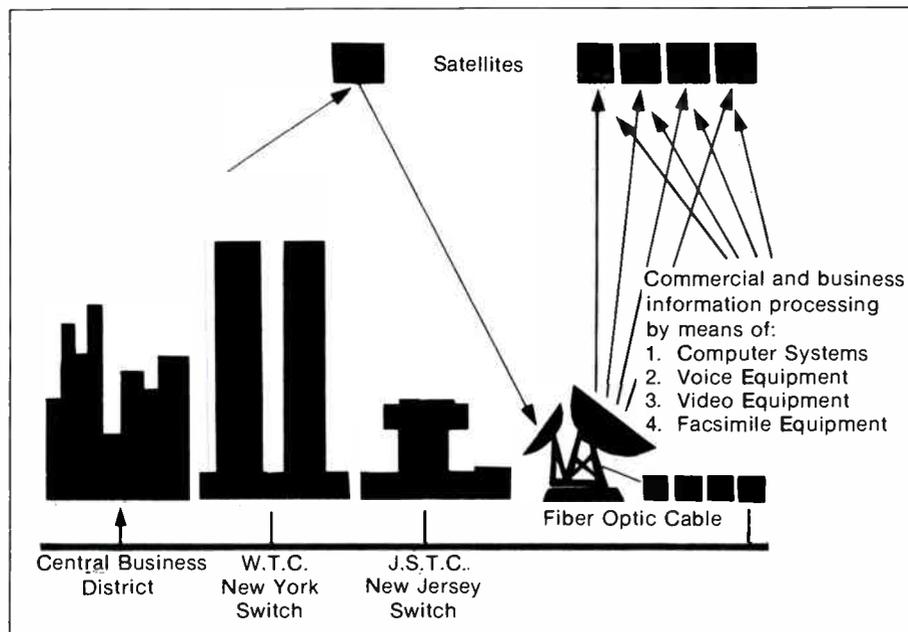
The FCC has approved a plan by Communications Satellite Corporation to construct new satellite earth station facilities at Bloomsburg, Pennsylvania, which COMSAT estimates will cost \$61.2 million to build. The proposal was filed on behalf of the United States Earth Station Ownership Consortium (ESOC) for operation with the INTELSAT satellite system, providing all types of international transmissions. The new facilities will include a 6/4 GHz antenna, a 14/11 GHz dish and a backup antenna which will have the capability of operating on both frequency pairs. The commission's approval was granted on the condition that TRT Telecommunications Inc. be allowed to join the ESOC, which currently includes COMSAT, AT&T, RCA Global Communications and Western Union International. COMSAT said the new facility, which is expected to be operational in 1984, will help handle projected traffic increases.

## Times Fiber Develops New FO Splicing Technique

LAS VEGAS, NEVADA—Times Fiber Communications has significantly reduced the splicing time and complexity of splicing fiber optic cable. According to Douglas Pinnow, director of research and development for Times Fiber, they have refined a special cleaving technique that permits the hair-thin fibers to be cleaved, joined inside a metallic sleeve and soldered. The technique takes five minutes to complete.

The worker uses a cleaving tool that looks and operates much like an oversized nailclipper. The worker first strips the hair-thin fiber of its plastic cladding, then places the fiber into the cleaving tool which aligns the fiber, secures it in place and, when pressed, nicks the glass fiber. The worker then snaps the fiber in two which leaves the end prepped and ready to be butted against the other fiber end to be spliced.

For splicing the two cleaved ends together, the worker places the ends into a metallic sleeve and bonds the metal sleeve with a spot of solder. The heating involved in the soldering shrinks the sleeve tight to the glass fibers. No epoxy is used and no curing time or polishing of the epoxy is required. Previous techniques required the field use of microscopes for



**Schematic diagram shows plan for link between Manhattan and Staten Island teleport planned by the Port Authority of New York and New Jersey.**

# TFC'S INNOVATIVE ENGINEERING GIVES YOU SECURITY AGAINST MOISTURE INGRESS.

Your moisture ingress problems are solved with T4, a new generation of gas injected polyethylene foam core cables. Moisture ingress is blocked between the center conductor and dielectric and through the dielectric itself.

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This precisely controlled conductor interface layer provides an effective moisture shield without sacrificing handling ease. T4 strips quickly and conveniently for reliable, scrape-free connections.

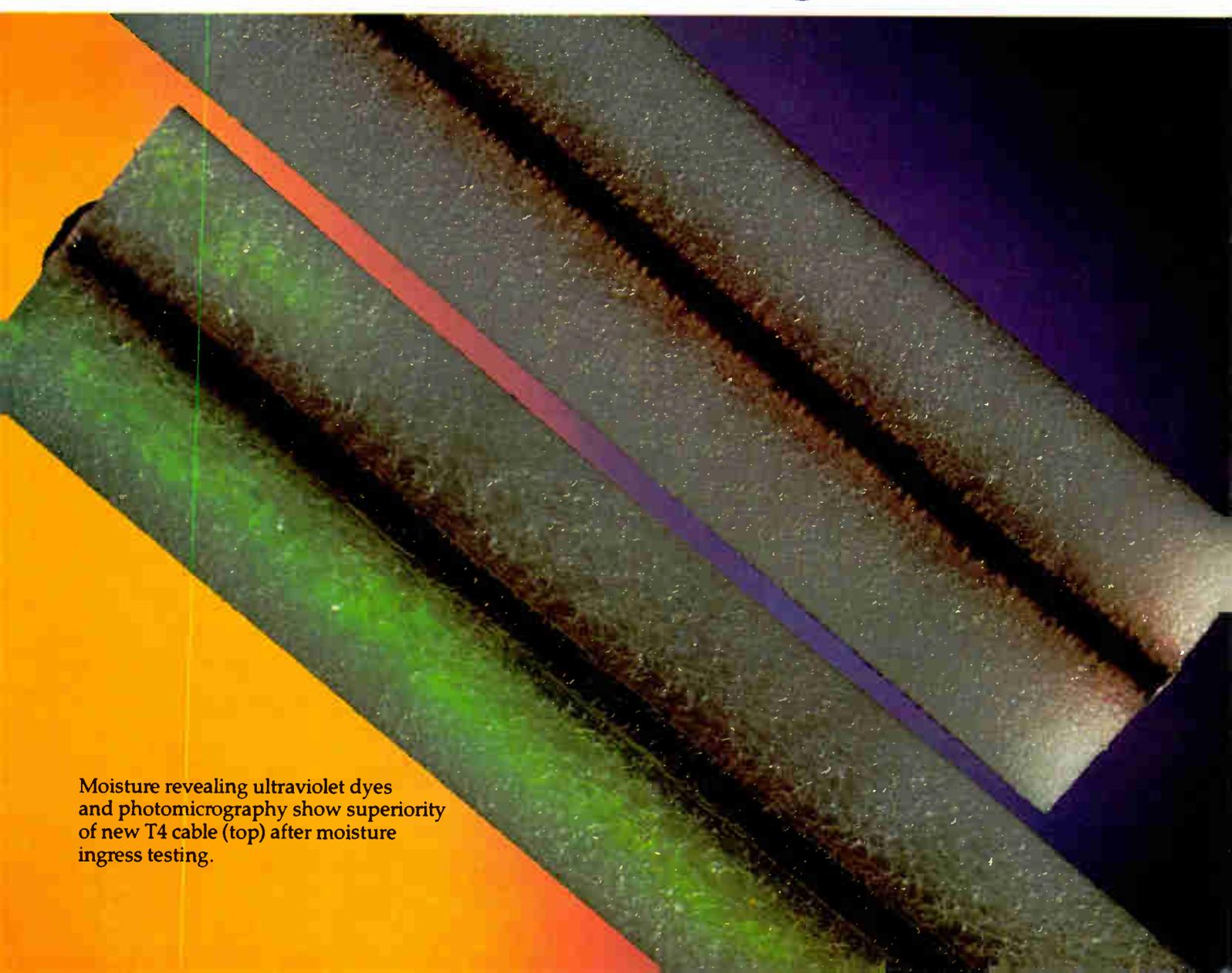
T4's cell structure is formed by the use of proprietary nucleating agents combined with advanced foam processing technology. The result is an

ultra-fine, moisture blocking, closed cell matrix. Cell integrity is maintained from the conductor coating through the outside surface and remains moisture resistant through the stresses of drawing, installation and environmental exposure.

For a sample of this remarkable new T4 cable, contact TFC today at P.O. Box 384, Wallingford, CT 06492, (203) 265-8500.



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Moisture revealing ultraviolet dyes and photomicrography show superiority of new T4 cable (top) after moisture ingress testing.

alignment, epoxy for adhesion of the spliced ends, 24-hour curing of the epoxy, and polishing of the spliced fiber.

## S-A Offers Satellite Addressability

ATLANTA, GEORGIA—Scientific-Atlanta Inc. is now offering equipment needed to address programs to U.S. cable subscribers via satellite. The new addressable-by-satellite system is designed to control addressable terminals in any number of CATV systems nationwide from a single computer located at a central or regional satellite transmitting site.

Authorization instructions are introduced at the main computer and converted to a digital format. The digital message is transmitted at 56 kilobits per second on single-channel-per-carrier (SCPC) equipment, permitting up to 20 carriers on any satellite transponder without interfering with video transmission.

The primary components of the S-A addressable-by-satellite system on the transmit side are a mainframe or distributed processing computer system, an intelligent control unit (ICU), a multiplexer, a digital modulator and associated earth station transmit equipment. On the receive side is the standard satellite earth station now in general use in the CATV industry, a digital demodulator, a demultiplexer and an intelligent transmitter (IT).

The company is working with Tele-Communications Inc. to install a pilot system in Denver, Colorado.

## Must carry must-carries

QUINCY, WASHINGTON—Quincy Cable TV has been fined \$5,000 by the Federal Communications Commission for "willfully" violating rules in deleting two must-carry signals in substitution of pay services. The operator of this 12-channel system had asked the FCC for permission to delete three duplicated network signals and was refused twice. The system went ahead and deleted two signals despite rulings.

## Centel Videopath Gains FCC Approval

CHICAGO, ILLINOIS—Centel Videopath has received permission from the FCC to build a communications network interconnecting Chicago area cable companies. The FCC also authorized Centel to temporarily operate microwave facilities that remotely obtain live events for distribution over the network.

The system has been designed as an ongoing exchange of cable programs, advertising and other types of communications among cable operators. It will be designed to operate over two-way microwave links.

The system's hub site will have uplink and downlink facilities for transmission and reception of satellite communications between cities anywhere in the country. A microwave relay tower will permit the network to communicate with cable companies at their headends.

Centel has overcome conflict of interest charges that stem from its Chicago franchising plans but has run into technical snags. The July 1 start-up date has been pushed back to August 1 because of delays. When it turns on, Videopath will link 125,000 to 150,000 subscribers, Centel officials claim.

## Subscription Programming

DALLAS, TEXAS—TOCOM Inc. has developed a new method by which cable operators can deliver pay-per-view programming with one-way addressable converters.

Called "subscription programming," this technique is specifically designed to allow for the sale of individual premium programs, or series of programs to the subscriber, unlike other addressable methods that use tiering to control pay-per-view. Each 55 plus converter can be authorized to receive up to four separate subscription programs, in addition to the packaged services that it normally is able to receive.

## NAB Urges Teletext Must-Carry

WASHINGTON, D.C.—The National Association of Broadcasters has told the Federal Communications Commission that teletext should be carried by cable systems because "the viability of teletext as a local information service offered free to the public depends upon the adoption of must-carry rules." NAB was responding to a proposal authorizing television stations to carry teletext.

## RCA For Reduced Satellite Spacing

WASHINGTON, D.C.—In response to an FCC plan to provide more orbital slots, RCA Americom has voiced support for three-degree spacing, rather than the present four degrees for domestic satellites. RCA said three-degree spacing could be achieved with minimum inter-satellite interference. The company has also recommended a program that includes uniform standards for future satellites, standards for earth stations, and strong inter-carrier efforts for a phased reduction to two degrees.

## First Roman Buy

MANLIUS, NEW YORK—New Channels Corporation of Syracuse, New York, is the

first company to order Roman one-way addressable converters. The deal, signed two weeks after the public introduction of the product, is a \$1.2 million agreement with delivery to begin in June.

The Roman converters are modular addressable units that, according to company officials, allow systems to pursue pay-per-view at a nominal cost. The product line is the result of a joint venture between Octagon-Scientific and Regency Electronics.

## Manhattan Cable To Use Scientific-Atlanta Modems

NEW YORK, NEW YORK—Manhattan Cable plans to upgrade its business communications network with high speed broadband data modems. The systems have purchased model 6402 T-1 modems from Scientific-Atlanta for use in its 17-mile institutional network offering data and teleconferencing capabilities to business subscribers in Manhattan.

## Business Notes



★ **Harris Satellite Communications Division** has announced that it sold over 125 Delta Gain Systems the first day of the NCTA show and had over \$1,000,000 in total sales for the three day event. The Delta Gain System, Harris' latest offering in the field of low-cost TVRO's, features three components, a 3-meter antenna, a video receiver, and LNA as well as other optional equipment. The **Sheridan Broadcasting Network** has ordered a total of 85 Delta Gain Systems. The new systems provides performance equal to a 4.5 meter prime focus system at a cost of 20 percent less.

★ **Group W Cable** has placed an order with **Harris Corporation** for ten receive-only satellite communications antennas. The 20-foot dishes will be installed at Group W facilities in California, Florida and Texas. They will be manufactured and installed by the Satellite Communications Division of Harris.

★ **Cox Broadcasting Corporation** has ordered approximately \$750,000 worth of videotape recording equipment from **Sony Broadcast Products Company**. The latest order includes 23 Sony BVU-800 U-matic videocassette recorders with built-in editing capability. The order also includes nine BVU-50 portable U-matic recorders, six BVU-110 U-matic recorders, one BVP-250, two BVP-330s and three BVP-300 cameras. Two editing systems, a BVE-5000 and a BVE-3000, were also ordered.

★ **M/A-COM Video Satellite Inc.** has received a contract for microwave equipment and its installation from **Centel**

# TFC'S INNOVATIVE ENGINEERING BRINGS YOU AN ULTRA-HARD FOAM CORE CABLE.

To fill your need for a superior coax which better withstands the abuses of installation and use, Times Fiber Communications developed T4: a new generation of polyethylene foam core cable. T4's ultra-hard core is highly resistant to kinking during bending or forming.

T4's very fine cell structure results from the use of proprietary nucleating agents, much harder polyethylene resins and

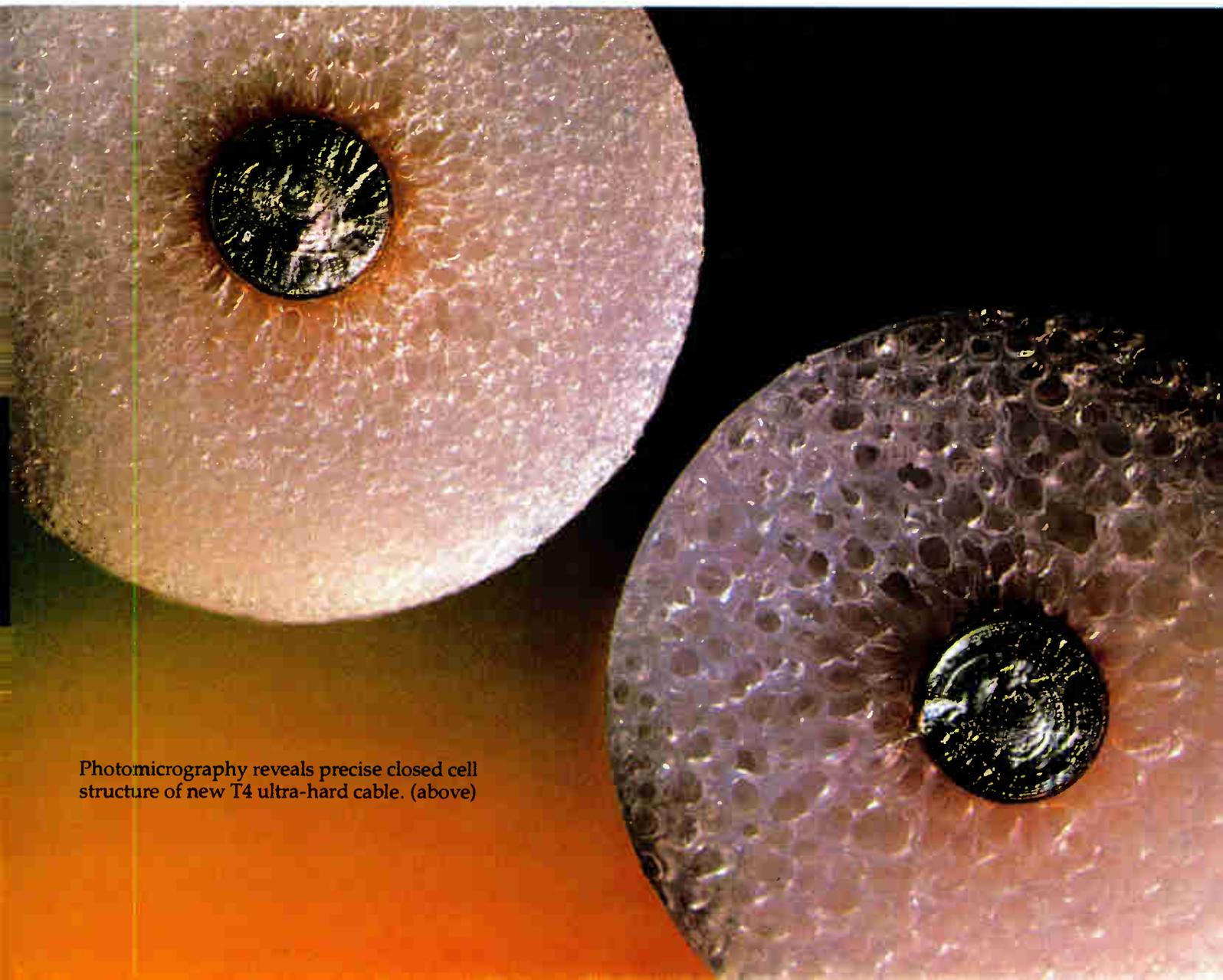
advanced foam processing techniques. With its precise cell matrix, you get vastly improved mechanical integrity both during cable installation and after severe environmental exposure.

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

velocity approaching 90%. Even with the increased "foaming" of the dielectric, hardness is maintained so that ease and reliability of installation are not affected.

For a sample of this remarkable new T4 cable, contact TFC today at P.O. Box 384, Wallingford, CT 06492, (203) 265-8500.

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

# Our Agile 24 satellite receiver system makes things perfectly clear.

Standard Communications' new Agile 24M/S satellite receiver system does everything a broadcast studio model does—except cost as much.

The Agile 24M is a highly cost-effective, reliable satellite receiver featuring advanced circuitry like a fully synthesized phase-lock-loop tuning system, a pre-selector tracking filter, and a PLL demodulator. Dual conversion design converts the incoming signal twice for better selectivity and image rejection. The threshold extension circuit reduces noise by as much as 2 dB on dark scenes, delivering a static threshold as low as 5.5 dB carrier-to-noise. That means blacker blacks in dark scenes, with reduced sparkles.

The Agile 24M is a 24-channel, stand-alone master receiver with sufficient gain to drive as many Agile 24S

slave receivers as required to satisfy any satellite communications system. The unique Agile 24S slave receivers offer all the operating features of the Agile 24M with the exception of the first block down converter. The active amplifier loop-through design of the Agile 24S is cost-effective, eliminating need for redundant passive power dividers.

Nearly all critical adjustments and test functions can be accomplished by accessing the front or rear panel of Agile 24/S receivers. The multi-function front panel meter permits zero tuning as well as carrier-to-noise metering, eliminating the need for special test equipment. Channel indicators display both transponder number and frequency in MHz.

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

around and a loan equipment plan are available to minimize system downtime.

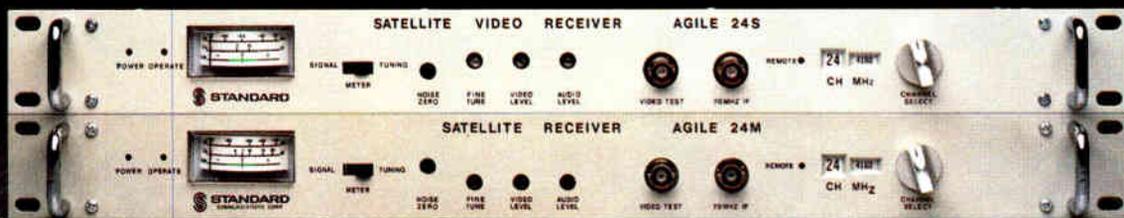
Look to Standard to handle all your TVRO system needs with a complete line of LNAs, down converters, earth station antennas and microwave interference filters.



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## ...the TVRO System people



**Videopath Inc.** of Chicago. Centel Videopath, a subsidiary of Central Telephone & Utilities Corp. plans to construct a comprehensive communications network interconnecting Chicago area cable TV companies. The purchase of M/A-COM's terrestrial microwave equipment including MA-12G transmitter and receiver pairs, antennas, waveguide and towers will provide the backbone for the network which will enable routine interaction of all broadband communications between various cable companies over the Videopath network.

★ **SatCom Technologies Inc.**, of Norcross, Georgia, has announced that its model 700CH 7-meter earth station antenna has been type accepted by PBS. PBS has placed an order for five antennas with SatCom Technologies. The antennas will be used to provide programming via satellite to PBS television broadcasting stations around the country. The model 700CH, incorporating a corrugated feed horn and high surface accuracy reflector, meets the new FCC proposed antenna requirements for 2° satellite spacing in both the transmit and receive bands. The antenna meets the same requirements for Ku-band operation with simple feed replacement.

★ **Scientific-Atlanta Inc.** has received a \$2.7 million order from **Cable Video Communications Inc.**, Bradenton, Florida.

The order calls for approximately 800 miles of distribution electronics with bridger switching/status monitoring capability, coaxial cable and a 54-channel capacity headend. The equipment will be used to build a new franchise in the city of Bradenton and the unincorporated surrounding area of Manatee County. The new system will have full reverse capability to provide optional non-entertainment services such as CATV security and eventually interactive home computer services.

★ **C-COR Electronics Inc.** has announced the first sale of its off-premise addressable converter SCAT System. The contract, signed by R. E. Hook of **Ruston Seemore TV Inc. and Alabama TV Cable Inc.**, calls for an initial quantity of 5,000 SCAT sets with deliveries beginning in May, 1982. The SCAT sets, to be installed in cable television systems in Ruston, Louisiana, and Aliceville, Alabama, will serve both individual homes and multiple dwellings such as apartments and condominiums. Initial deliveries of the SCAT System will be for the basic SCAT to be followed by SCAT Mod I, a second generation SCAT, beginning in January of 1983. The Mod I system will offer additional features such as passing FM and addressing more than one set in the home.

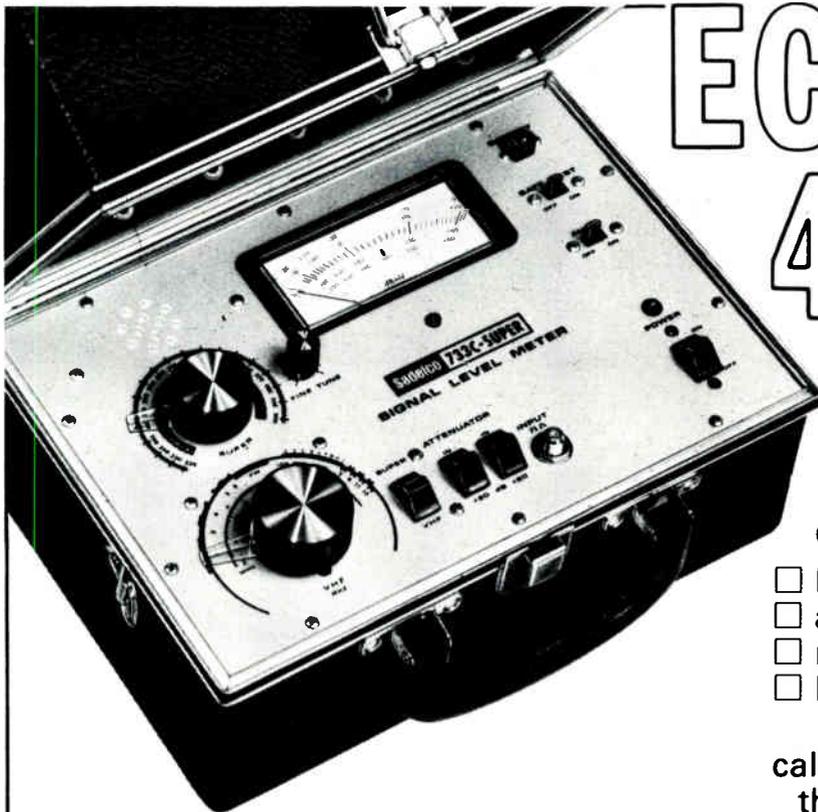
★ **Cable TV Puget Sound** is upgrading its Puget Sound, Washington, system with

a \$1.2 million order for Jerrold STARCOM IV converters that will make this the first 58-channel addressable system in the Pacific Northwest. The new Jerrold DRX-A remote control digital addressable units will replace Jerrold DRX-DIC 58-channel converter/descramblers now used by the system's 42,000 subscribers.

★ **Oak Industries Inc.** has reported its operating results for the first quarter of 1982. Sales for the quarter ended March 31 were \$134,745,000, compared to sales of \$124,692,000 in the first quarter of 1981. Net income for the quarter was \$7,450,000. Net income for the first quarter of 1981 was \$6,253,000.

★ **S.A.L. Cable Communications Inc.** has reported net income of \$735,000 on revenues of \$24,175,000 for the fiscal year ended January 31, 1982. In the previous year the company had net income of \$754,000 from revenues of \$18,376,000. S.A.L. had earnings per share of \$.71 for fiscal 1982 based on 1.2 million shares outstanding. A year earlier per share earnings were \$.94 based on 800,000 shares outstanding.

**CORRECTION:** The *Product Profile* section of the April issue of **CE** incorrectly listed the price of the Phasecom Corporation model 2106 modulator as \$895. The actual price is \$1,295.



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# No Loose Ends

Techniques For Tests And Measurements Using The Spectrum Analyzer—Part I

Beginning with this issue of **CED** and continuing in the August, October, and December issues, **CED** presents a four-part series on the best and most thorough use of the spectrum analyzer for laboratory quality CATV tests and measurements, proof-of-performance, and system maintenance. This series is a state-of-the-art update of the widely used original *No Loose Ends* published by Tektronix in 1973, written by Clifford B. Schrock.

By Linley Gumm, principal engineer, Communications Division, Tektronix Inc.

**S**pectrum analyzers have been used by the television industry for a number of years to verify signal quality and as a maintenance tool. With their extended capabilities and ease of use, modern spectrum analyzers have become the ultimate tool for CATV signal verification and equipment analysis. The entire output signal content of a CATV system can be viewed at a glance with analyzers available today. Select one channel for closer scrutiny, make a simple adjustment, and the carrier and sidebands are quickly and clearly displayed for analysis or measurement.

In today's competitive market, CATV system owners and operators are becoming more aware of what it takes to keep subscribers happy—high quality

pictures and little or no down time. Test equipment such as a high quality spectrum analyzer can make a significant contribution in a CATV signal analysis and maintenance program.

Technological advances in state-of-the-art spectrum analyzers like the Tektronix 7L12 and 7L14 are now pro-

viding laboratory quality CATV measurements in the field, with accuracy and repeatability unattainable only a few years ago. FCC proof-of-performance requirements and the existence of 50-plus channel and two-way systems have increased the necessity for properly maintained and operated CATV systems.

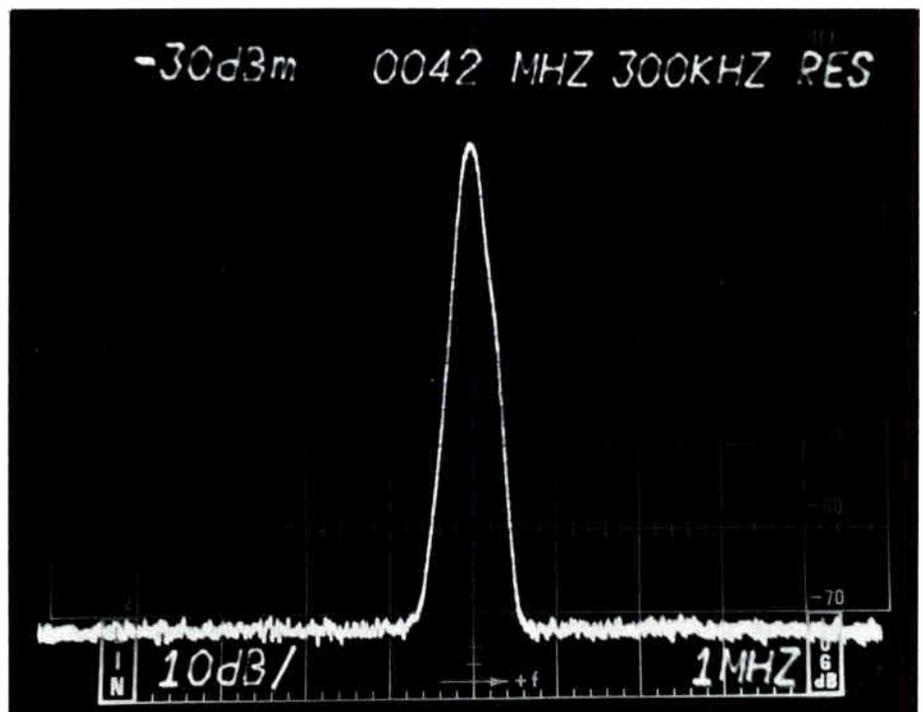


Figure 1-1 Reference level illustration.

Quality test equipment is available today but many operators will not benefit significantly because a knowledge of proper measurement techniques and interpretive skills is vital for accuracy and repeatability. Properly using a spectrum analyzer requires skill, familiarity, and tried and proven test setup and measurement techniques, carefully performed.

Starting with this issue, **Communications-Engineering Digest** provides its readers with a four-part series of installments that will help develop proficiency in the measurement and verification of FCC-regulated CATV parameters. Each installment will include measurement procedures, equipment lists, test setup diagrams, and actual waveform photographs. This information is published courtesy of Tektronix Inc. of Beaverton, Oregon.

The photographs displayed throughout the series of installments were all taken with a 7L14 spectrum analyzer in a 7613 mainframe. Except for differences in the CRT readout, results obtained with a 7L12 will be the same. In some cases the 7L14's digital storage was turned on to show its advantages. These cases are noted in the text.

## 1. Measurements With The Spectrum Analyzer

Measurements made with a spectrum analyzer are somewhat different than those made with an oscilloscope. Once these differences are understood however, most measurements can be made easily and rapidly.

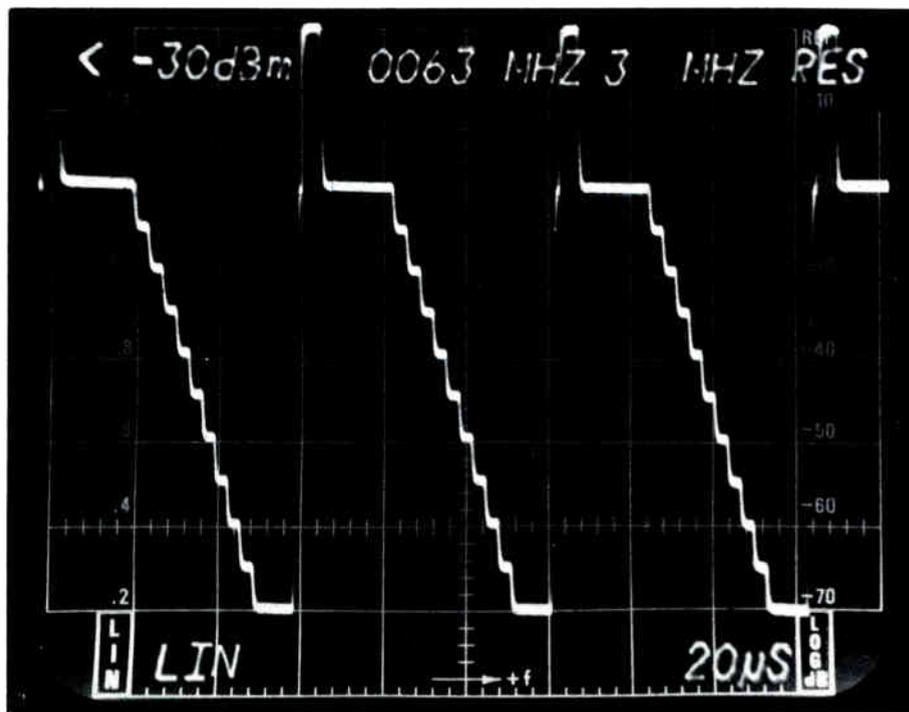


Figure 1-2 Internal 50 MHz calibrator frequency comb.

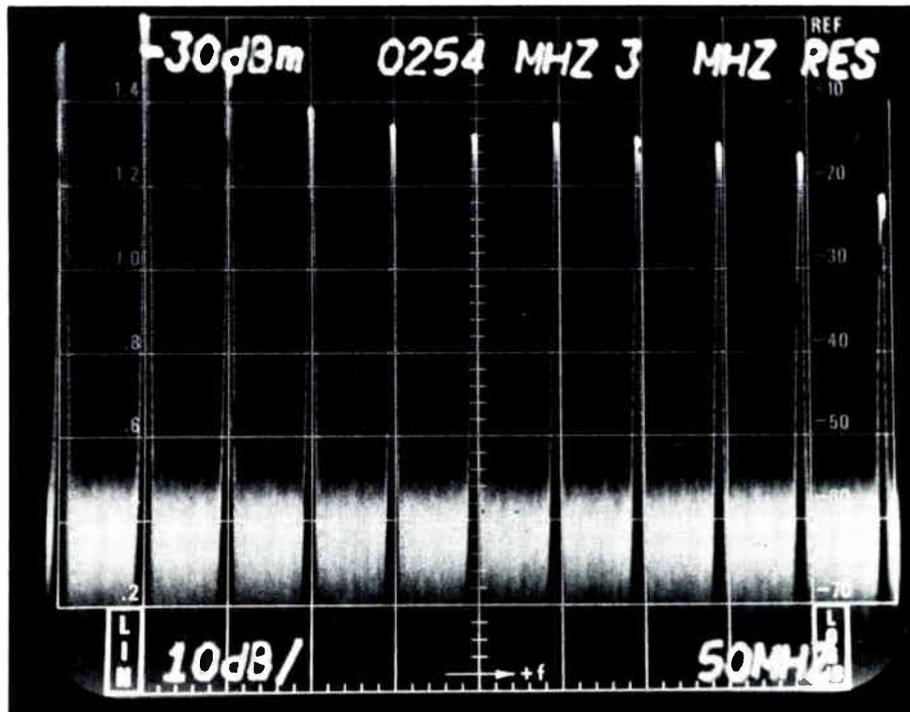


Figure 1-3 Zero span operation.

Changing the *reference level* of the analyzer effectively selects a range of measurement. The actual reference level is the top graticule line on the display (figure 1-1). In all cases, waveform amplitude measurements made with a spectrum analyzer are referred to the top graticule line. Amplitude is measured by counting down from this reference in increments determined by the vertical dB/DIV switch setting. Note in the examples how the direct readout of a Tektronix 7000 series oscilloscope en-

hances the readability of the display (figure 1-1).

## Calibration For Accuracy

The modern spectrum analyzer should be calibrated periodically to ensure continued high accuracy. Most analyzers can be calibrated for both amplitude measurements and horizontal accuracy.

Tek spectrum analyzers provide an internal calibration standard that simultaneously generates a highly accurate fundamental for amplitude calibrations and a series of harmonics to verify horizontal sweep accuracy (figure 1-2). Instructions for using the internal calibrator are contained in the instruction manual supplied with each spectrum analyzer.

Whenever an analyzer is plugged into a different mainframe oscilloscope, the complete front panel calibration procedure outlined in the instruction manual should be performed to verify proper performance.

The 7K11 CATV Preamplifier includes a precision 75 ohm calibrator that should be used to calibrate the preamp and analyzer together. When using the 7K11, the dBm calibrator in the 7L12 should be ignored.

## Zero Span

Most high quality spectrum analyzers provide a zero span mode to convert the analyzer into a tuned receiver for time domain displays. In this mode, the bandwidth of the analyzer/receiver can be selected with its RESOLUTION control. Frequency tuning is accomplished with

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the FREQUENCY control(s). The proper method for tuning an analyzer in Zero Span mode is as follows:

1. Select the 10 dB/DIV mode and adjust the FREQUENCY controls until the desired carrier peak lies on top of the center line of the graticule. Narrow the span to about 10 kHz/DIV while keeping the signal centered with the FREQUENCY control(s).
2. Select a reference level such that the carrier peak is slightly below the top graticule line on the analyzer.
3. Set the FREQUENCY SPAN to Zero Span mode.
4. The detected waveform should now be visible across the top of the analyzer screen.
5. The vertical size can be increased by selecting the LINEAR mode and using the REF VAR control.
6. The vertical position can be changed with the REF VAR and the REFERENCE LEVEL controls.
7. The sweep rate can be changed using the TIME/DIV control.
8. The analyzer/receiver should be fine tuned for maximum vertical (upward) deflection.

Although the limited bandwidth (3 MHz) in Zero Span mode precludes its use for accurate evaluation of television waveforms, the identification of various carriers

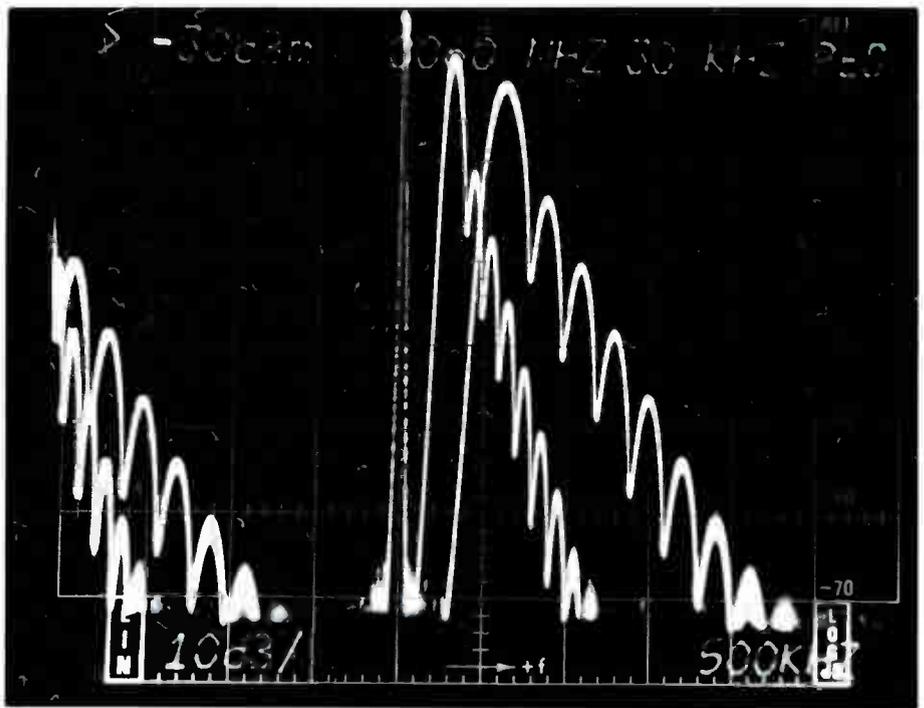


Figure 1-4 Sweep rate errors.

and the measurement of low-frequency disturbances such as hum, are quite easy (figure 1-3).

### Sweep Rate Errors

When using a spectrum analyzer, a

number of precautions must be observed to prevent distortion of the displayed waveform and resultant measurement inaccuracies. A spectrum analyzer includes filters in various configurations and it is quite possible to filter out or distort the desired waveform of frequency while

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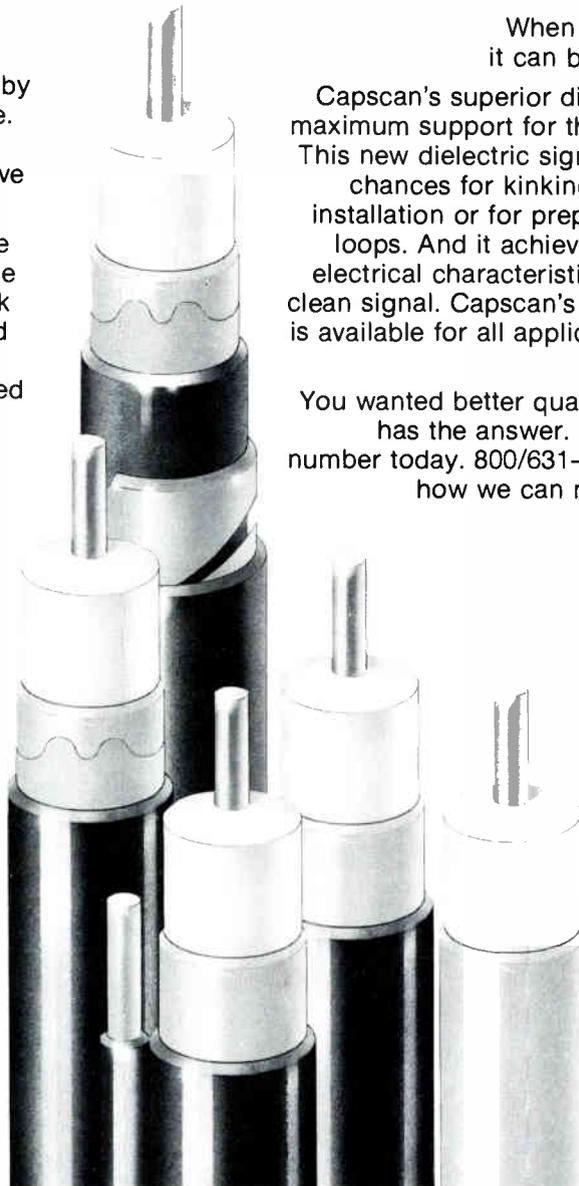
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trying to suppress an undesired one.

Critical relationships exist in the selection of RESOLUTION BANDWIDTH, FREQUENCY SPAN, VIDEO FILTER, and TIME/DIV. As narrower bandwidths and/or video filters are selected, it

becomes necessary to reduce the sweep speed. Exact corresponding relationships vary with different analyzers, however, a good rule of thumb is to perform the following test each time one of the above controls are changed: Slow down the

sweep speed progressively until the peak of the waveform is not compressed. Vary this by increasing the sweep until the peaks begin to compress, then return the sweep speed to the point of no compression.

Figure 1-4 is a multiple exposure illustrating the effect of increasing the sweep rate progressively. Note how the axis is shifted to the right as the sweep rate is increased in addition to the amplitude distortion. In this case, an amplitude error of 8 dB is caused by the sweep speed. The use of narrow filters requires slow sweep rates to attain accurate measurements.

The use of mechanical interlocks on the Tektronix 7L12 and 7L14 FREQUENCY SPAN and RESOLUTION BANDWIDTH controls, minimizes the occurrence of waveform distortion due to operator inexperience. Some analyzers such as the Tektronix 7L14 have an UNCAL light that illuminates when the sweep speed is too fast.

### Video Modulation

The first time a quality spectrum analyzer is used for television analysis, a characteristic of video modulation will be observed: vertical interval roll-through. Selection of a wide resolution bandwidth (300 kHz) and a frequency span of 1 MHz

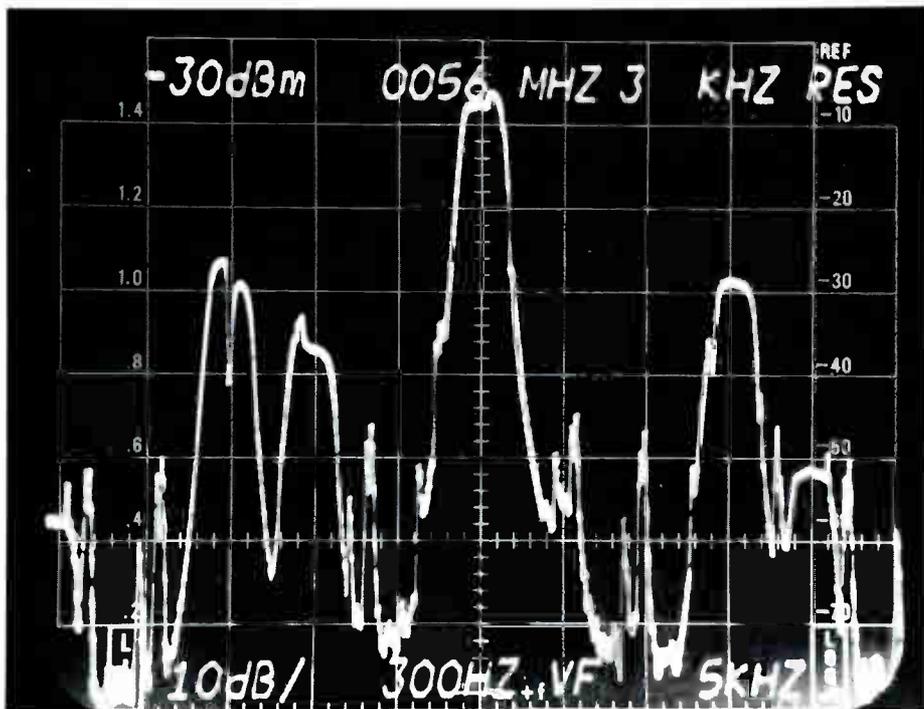


Figure 1-5 Vertical interval roll-through.

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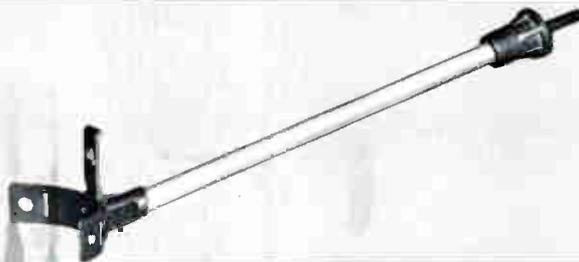
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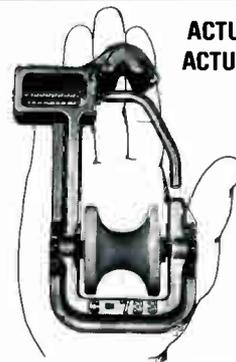
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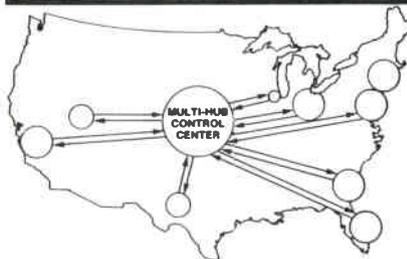
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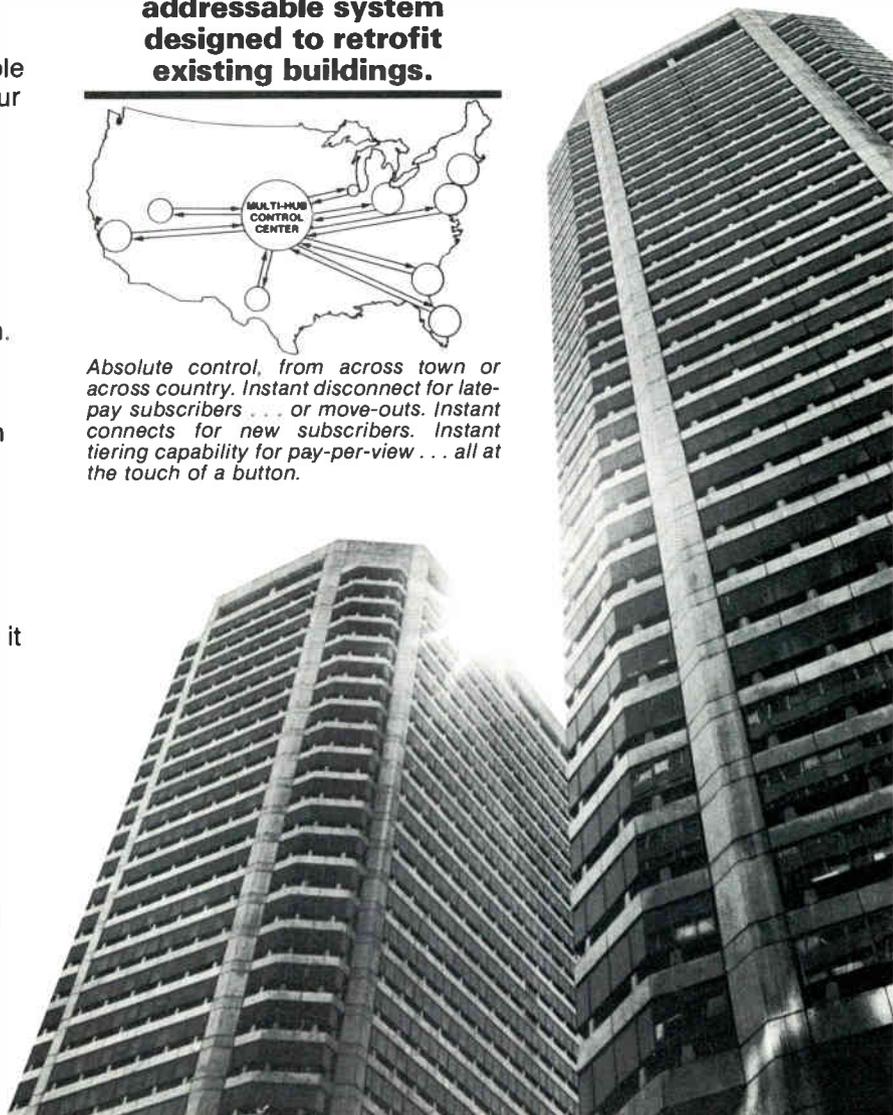


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or less permits observation of these inverted waveforms (which are similar to that encountered on a conventional television waveform monitor). Depending on the sweep rate selected, the vertical interval will roll through in either direction (see figure 3-2).

If narrow bandwidths are used during co-channel testing, vertical interval roll through will be observed, although the similarity to a television waveform will not be as apparent (figure 1-5). Novice operators tend to misinterpret this waveform as random beats of interference. The following simple tests can be performed to identify or separate the normal vertical

interval roll through from a suspected beat or distortion:

1. Vary the sweep speed. Vertical interval roll through patterns will change speed and/or direction. Beats will remain stationary.
2. Increase video filtering and use variable persistence. Vertical interval roll through patterns will decrease in size, while beats will remain the same size.

### Display Devices

Spectrum analyzers are available in a number of configurations that are depen-

dent on their intended usage. Some of the display variations are normal CRT, variable persistence CRT, storage CRT, or combinations of these three.

The Tektronix 7L12 and 7L14 Spectrum Analyzers are plug-ins and therefore can be accommodated by several Tektronix 7000 series mainframe oscilloscopes of both the storage and non-storage type. To decide on the most useful combination, a user could consider application requirements versus cost.

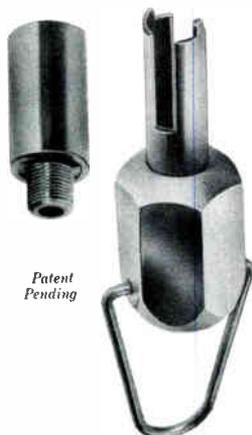
For CATV, the storage and variable persistence capabilities of a 7613 mainframe, though not completely necessary, make measurements quite convenient. If a Tektronix 7L14 is used, any Tektronix 7000 series mainframe may be used.

In many cases the most effective use of a spectrum analyzer involves using slow sweep speeds. Without storage, the resultant display can be difficult to follow and interpret. Storage can be used very effectively to pinpoint intermittent problems. After a waveform is stored, any number of photos can be taken for verification without the display changing.

The 7000 series mainframes include a direct readout feature that simplifies the

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—Abram Ackerman, President

***In many cases the most effective use of a spectrum analyzer involves using slow sweep speeds. Without storage, the resultant display can be difficult to follow and interpret.***

use of the analyzer and makes photo recording easier. Control settings are displayed directly on the screen, including corrections for various control combinations selected.

### The Camera

The value of the spectrum analyzer can be greatly enhanced with a camera. The polaroid photograph is quick and convenient for many measurements. For amplitude tests, one photo can be taken in the field in 15 seconds and interpreted later or compared to others.

Tektronix Inc. offers a line of cameras for almost all oscilloscope and waveform equipment. A Tektronix C-5C camera can be used with a 7000 series mainframe.

Polaroid film has a characteristic that enhances its use for permanent records.

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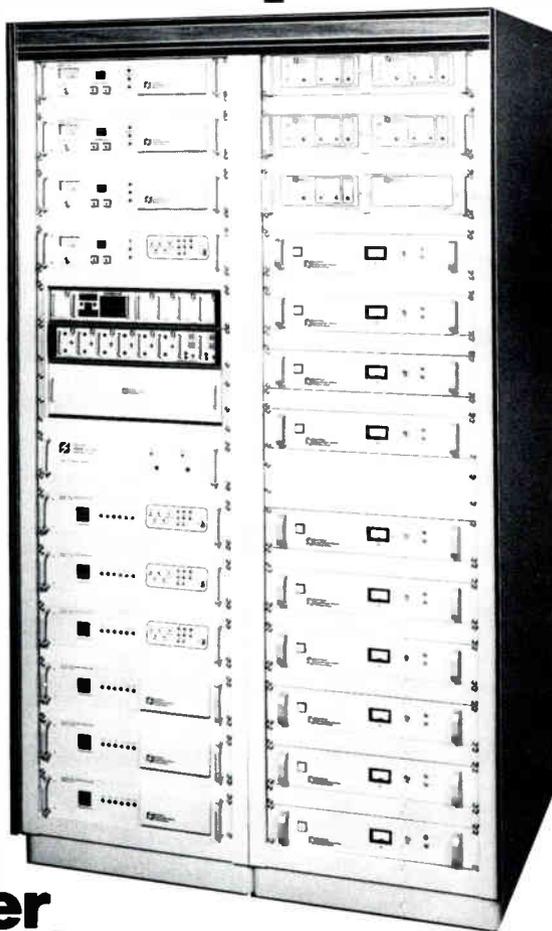


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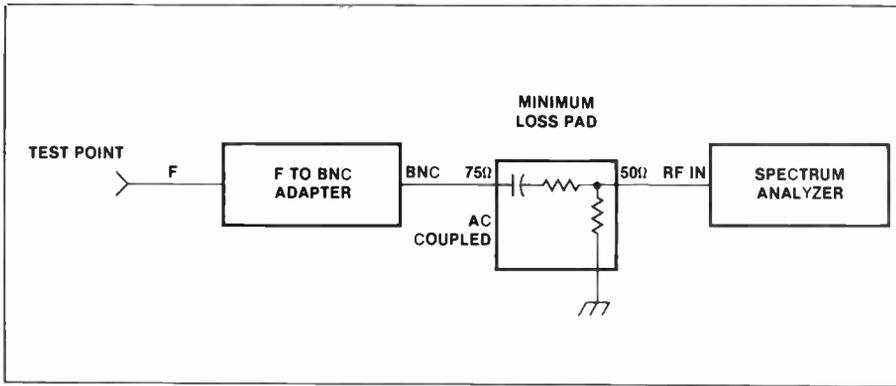


Figure 2-1 Equipment connection for amplitude measurements.

Note: Figures 2-1 and 3-1 are identical

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Extra information such as the date, location, time, temperature, etc., can be scribed with a sharp pointed object, such as an awl. Once the picture has been coated, all added information becomes a permanent record that cannot be altered without damaging the photo.

We recommend the camera as an excellent tool for anyone with more than a casual interest in waveform analysis or spectrum analysis.

## Summary Of Technical Standards (FCC: 376.605)

1. Frequency of the visual carrier: 1.25 MHz, 25 kHz above channel boundary.
  - a. At output of converter: 1.25 MHz, 250 kHz
2. Frequency of aural subcarrier: 4.5 MHz, 1 kHz
3. Minimum visual signal level: 1 mV across 75 ohm (0 dBmV)
4. Permissible signal level variation: 12 dB total/24-hour period
  - a. Maximum adjacent channel variation: 3 dB
  - b. Maximum of all channels: 12 dB
5. Maximum signal level: Below threshold of degradation (overload) point
6. Maximum hum and low frequency disturbance level: five percent
7. Within channel frequency response: 2 dB from -5 MHz to 3.75 MHz
8. Aural signal level: 13 to 17 dB below visual signal level
9. Signal-to-noise level for all signals picked up or delivered within its grade B contour: 36 dB S/N ratio, 36 dB co-channel
10. Signal to intermodulation and non-offset carrier interference: 46 dB intermodulation
11. Subscriber terminal isolation: 18 dB or more if required
12. Radiation:
  - a. Up to 54 MHz: less than 15  $\mu\text{V}/\text{m}$  at 100 feet
  - b. 54 to 216 MHz: less than 20  $\mu\text{V}/\text{m}$  at 10 feet
  - c. Above 216 MHz: less than 15  $\mu\text{V}/\text{m}$  at 100 feet

## 2. Carrier Amplitude Measurements

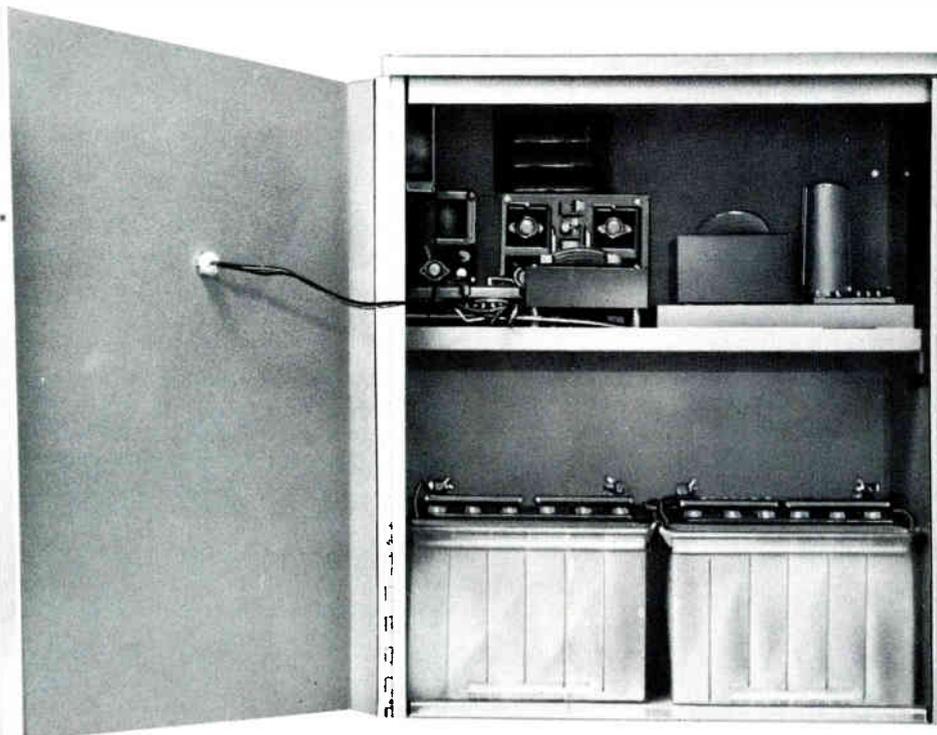
Tektronix spectrum analyzers are capable of measuring signal levels accurately within the range of -42 dBmV to +79 dBmV. In addition, carriers with amplitude differences up to 80 dB can be displayed simultaneously on the screen in the 10 dB/DIV mode.

## Equipment Required

1. Spectrum Analyzer: Tek 7L12 or 7L14 Plug-in.

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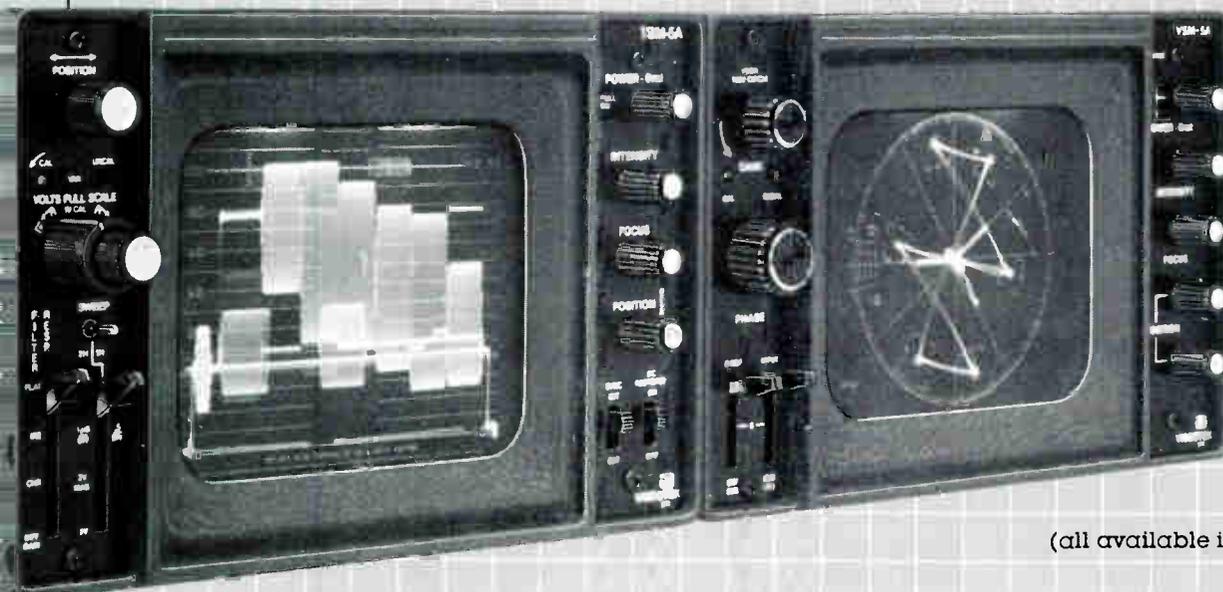
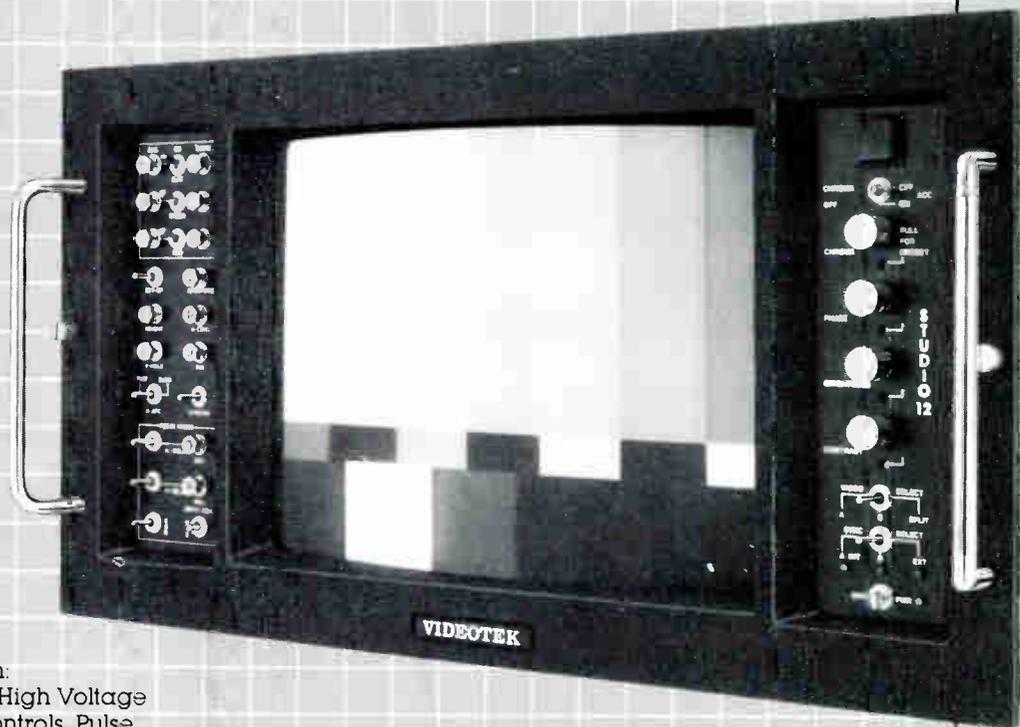
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2. Mainframe: Tek 7613 or any 7000 Series mainframe.
3. Minimum Loss Pad: Tek P/N 011-0112-00 (or 011-0118-00 Impedance Matching Pad).
4. F to BNC Adapter: Tek 013-0126-00.
5. Camera (optional): Tek C-5C or equivalent.
6. Preamplifier: Tek 7K11 plug-in. (Except when 7L14 is used.)

### Procedure

1. Verify the calibration of the spectrum analyzer using the internal calibrator. Also check vertical and horizontal position. (See analyzer manual.)
2. Set up the 7613 mainframe as follows:
  - a. VERTICAL MODE: RIGHT (7L12) or LEFT (7L14)
  - b. TRIGGER SOURCE: VERT MODE
  - c. INTENSITY: 12 o'clock or as required for a usable display
  - d. READOUT: 12 o'clock or as required to match trace intensity
  - e. GRATICULE ILLUMINATION: Max clockwise
  - f. MODE: NON-STORE
3. Set up the spectrum analyzer as follows:
  - a. FREQUENCY: About 64 MHz Center mode (7L12)
  - b. MODE: NORM
  - c. SOURCE: FREE RUN
  - d. TIME/DIV: 10 ms
  - e. FINE: Both knobs centered
  - f. 10 dB/DIV
  - g. BASE LINE CLIPPER: Max counter-clockwise

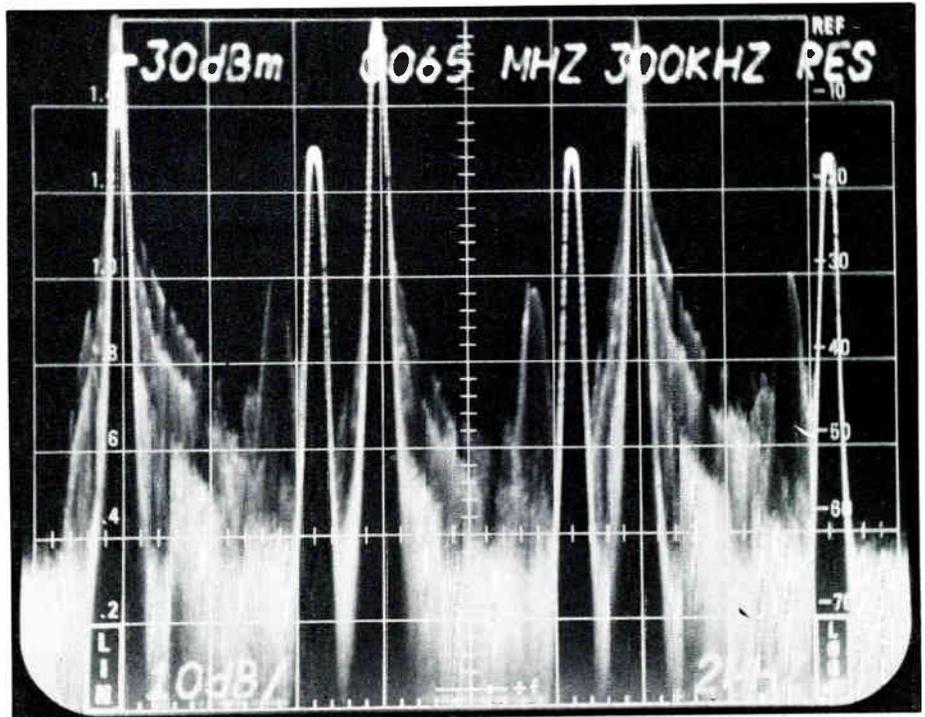


Figure 2-3 Amplitude measurements using the 7L14's digital storage.

- h. CONTRAST: Max clockwise
- i. REFERENCE LEVEL: -30 dBm; RF ATTENUATION (outer ring); 10 dB (Adjust outer ring for 10 dB in window, and then adjust bar knob for -30 dBm); REF VAR: Calibrated
- j. VIDEO FILTER: Both buttons OUT
- k. VIDEO PROCESSOR: OFF
- l. AUTO PHASE LOCK: ON
- m. RESOLUTION: 300 kHz (outer ring)
- n. FREQUENCY SPAN/DIV: 2 MHz

4. Connect the subscriber tap to an F to BNC adapter. Connect the adapter to the Minimum Loss Pad and then to the spectrum analyzer's RF IN connector. See figure 2-1.
5. Using the FREQUENCY knob, center the channel 2 picture carrier over the first graticule line from the left.
6. Slowly turn the BASELINE CLIPPER clockwise to clip as much of the grass at the bottom of the screen as desired. Your display should look similar to that shown in figure 2-2.
7. Picture and sound carrier amplitudes can now be measured on the 7L12. Since the reference level of the 7L12 is -30 dBm, an input signal must have an amplitude of -30 dBm to reach the top line (REF) of the graticule. Using the vertical scale factor of 10 dB/DIV, note the signal amplitude at the tip of each displayed carrier.

If you are using the Tek Minimum Loss Pad 011-0112-00, the conversion to dBmV can be accomplished by adding 54.5 dB to every level read. If the Tek Impedance Matching Pad 011-0118-00 is used, the conversion to dBmV can be accomplished by adding 60 dB to every level read.

EXAMPLES: Picture carrier for channel 2 in figure 2-2 is:

-30 dBm + 54.5 dB  
=24.5 dBmV

The sound carrier for channel 2 is:  
-45 dBm+54.5 dB  
=9.5 dBmV

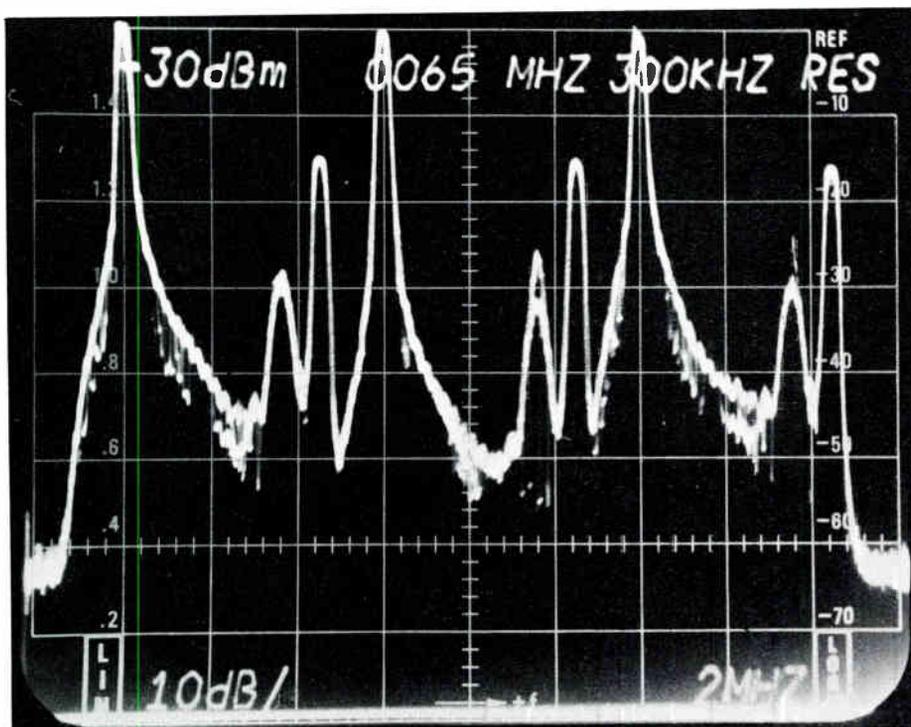


Figure 2-2 Channels 2, 3 and 4.

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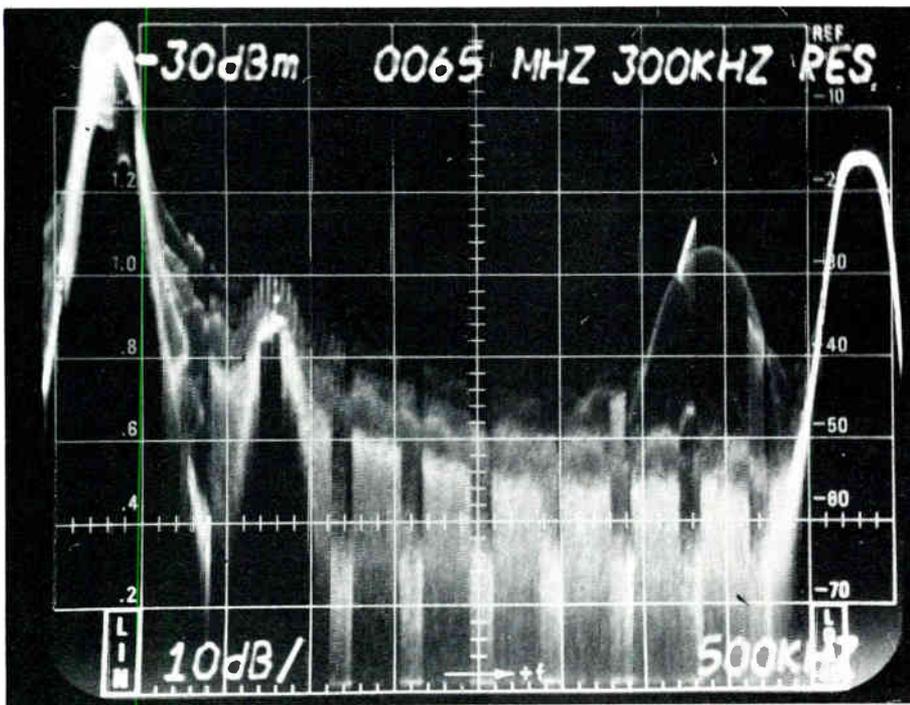
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**Figure 3-2 Intermodulation measurement.**

The difference between the picture and the sound carrier is: (-30 dBm) - (-45 dBm) = 15 dB

### Hints, Notes and Precautions

1. The Tektronix Model 7K11 CATV Preamplifier automatically converts from 75 ohms and dBmV to 50 ohms and dBm making conversions unnecessary. It directly reads out the REF LEVEL in 700C Series oscilloscopes.
2. The 7L14's digital storage capability makes carrier amplitude measurements easy. (See figure 2-3.) Position the PEAK/AVERAGE cursor at the bottom of the display so that the storage circuitry will capture the sync tip amplitude. Digital storage is especially valuable where slow speeds must be used.
3. In the preceding amplitude measurements, 10 dB of input RF attenuation was used to provide a good termination and thus improve accuracy. Depending on the levels being read, the input attenuation and IF gain can be adjusted to bring the largest carrier within the top division of the screen. This adjustment makes carrier signal measurements more convenient.
4. High sweep speeds can cause inaccurate amplitude readings.
5. The 2 dB/DIV mode gives highly accurate amplitude readings. Differences of 0.1 dB can easily be read. Absolute measurement accuracy is about  $\pm 1$  dB.

To use this mode, first use the REFERENCE LEVEL controls to bring

the input signals to within 10 dB of the REF LEVEL (top of screen). As you press the 2 dB/DIV button, the top 1.6 divisions of the screen are expanded to fill the 8 vertical divisions of the graticule. If the signal is too small to display in this mode, the beam will stop at the bottom graticule line. The INTENSITY and BASE LINE CLIPPER controls may need readjustment when using this mode.

6. As the spectrum of a TV channel is observed, the effect caused by the vertical interval will be seen rolling

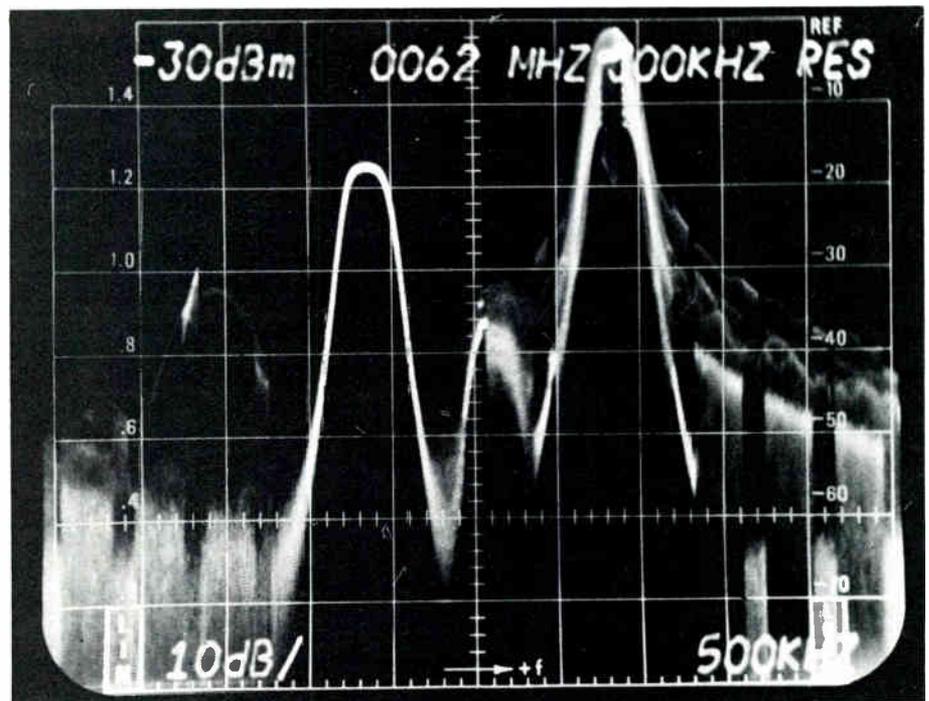
through the display. This effect is observed because each sweep takes a period of time. When the vertical interval is transmitted, the amplitude of its spectrum at the frequency the analyzer happens to be tuned to is displayed.

The spectrum of the vertical interval is quite different than the rest of the signal. The carrier is held at full power for a duration of three lines which produces a bright bar at the sync tips. The chroma burst is omitted causing a gap in the chroma spectrum, and so on. These effects are both useful and annoying.

7. Accurate carrier amplitude and flatness measurements can be made only when all connections preceding the Minimum Loss Pad are maintained at an impedance of 75 ohms. This requirement deserves careful checking. In other cases, where measurements are made relative to carrier amplitude over narrow frequency ranges, the signal to be measured can be directly connected to the 50-ohm input to the analyzer.

### 3. Intermodulation Capability

The spectrum analyzer is a valuable tool for intermodulation analysis, producing graphic, easy-to-understand results. It can be used at any point in the system to systematically locate the source of a beat problem, or to optimize equipment for a minimum beat condition. Depending on the subscriber tap level, it may be necessary to use a preamplifier to increase the sensitivity of an analyzer. Careful adjustment is indicated to ensure



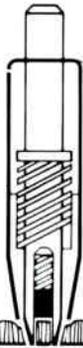
**Figure 3-3 Intermodulation beat below the picture carrier.**

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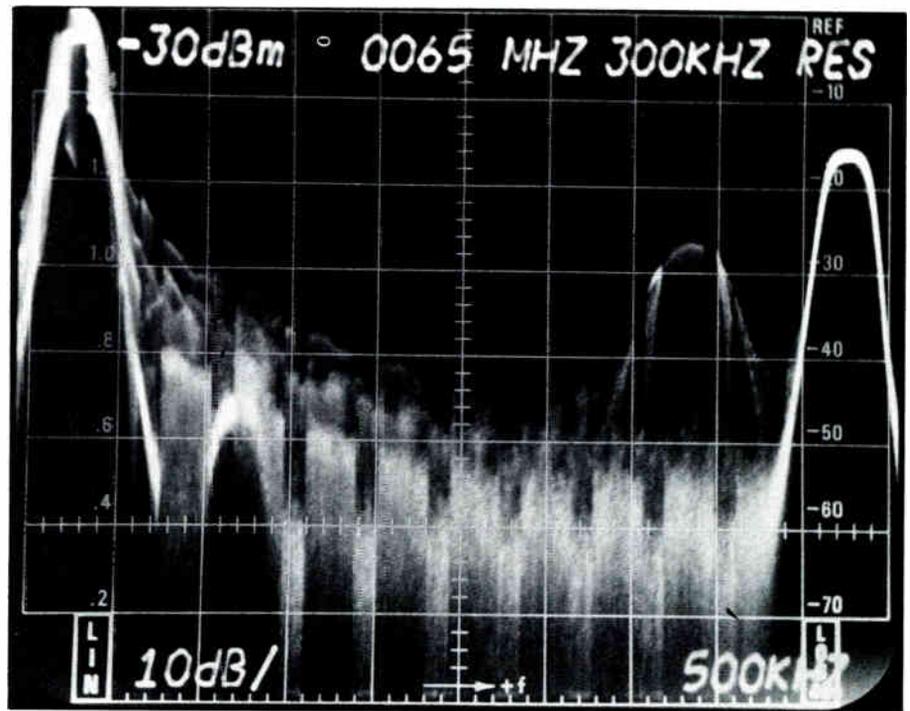
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**Figure 3-4 Low level intermodulation beat.**

that spurious products are not generated in the preamplifier.

### Equipment Required

1. Spectrum Analyzer: Tek 7L12 or 7L14.
2. Mainframe: Tek 7613 or any 7000 Series mainframe.
3. Preamplifier: Tek 7K11 (Optional Not usable with 7L14.)
4. Minimum Loss Pad: Tek 011-0112-00 or 011-0118-00 or equivalent.
5. F to BNC Adapter: Tek 013-0126-00 or equivalent.

### Procedure

1. Set up the equipment as illustrated in figure 3-1.
2. Select a frequency span of 0.5 MHz/DIV, 300 kHz resolution bandwidth and the 10 dB/DIV display mode. Tune in the channel to be tested.
3. Once a beat signal has been located, it can be measured by comparing the peak video carrier level to the peak beat level (figure 3-2).
4. Intermodulation and random beats also can be located below (to the left of) the picture carrier as shown in figure 3-3. When searching for beat signals, use the FREQUENCY control to slowly pan across the entire channel. To obtain satisfactory results, intermodulation measurements must be performed both slowly and carefully.
5. The sensitivity of the intermodulation measurements may be increased at low subscriber tap levels by using the 7K11 CATV Preamplifier with steps 1 through 5. SEE HINT 4.

### Hints and Precautions

1. Select a flicker-free sweep rate to

cause the video information to move across the screen without obscuring any of the beats.

2. Sometimes a beat can be detected although its level is below noise level. The noise around a beat contains a bump or hollow spot as shown in figure 3-4.
3. Vary the resolution bandwidth, sweep rate and video filters on the analyzer while adjusting the intensity and persistence to attain carriers that appear clear and distinct.
4. Verify that a beat is not a product of the preamplifier by decreasing its reference level by 3 dB. If the preamplifier is causing a problem, this 3 dB reduction in level will cause a reduction greater than 3 dB in the beat amplitude. For best results, protect the 7K11's input from overload with a bandpass filter.

*Linley F. Gumm was raised on an Eastern Washington wheat ranch. He holds a B.S.E.E. degree from Washington State University and a M.S.E.E. degree from the University of Washington. He began his career with Tektronix in 1964 and now holds the title of principal engineer. As a member of the engineering group within the Frequency Domain Instrumentation Business Unit, part of the Communications Division, at Tektronix Inc. in Beaverton, Oregon, Linley has been associated with the development of many quality spectrum analyzer instruments. Special thanks go to Clifford B. Schrock, who wrote the original version of No Loose Ends printed by Tektronix in 1973.*

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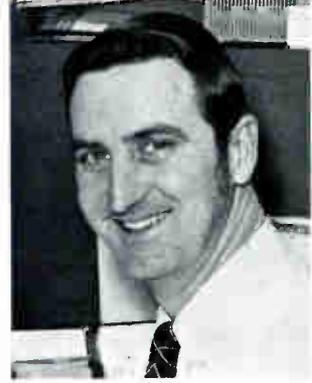
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# Proper Grounding Of Cable TV Systems

---

*By Theodore Bernstein, Department of Electrical and Computer Engineering, University of Wisconsin-Madison*

**C**able television installations are getting to be nearly as commonplace as utility poles in many areas around the country—4,400 operating systems serving some 10,400 communities in 1981, with 2,000 additional franchises approved but not yet built.

With the ubiquity of cable TV systems and the potential for home entertainment and information, however, comes a necessary precaution: the protection of home subscriber systems from power system and lightning surges.

In the most general sense, lightning poses two basic hazards. One is to people, the other is to structures, equipment, etc. The number of people actually killed directly by lightning in the U.S. is relatively small (100 to 150 a year), and such tragedies generally occur outside of buildings. The main danger to structures such as houses is that of fire.

With typical cable TV systems, there are several hazards. The major one is that of lightning going through the cable system to threaten life. The possibility of death or serious injury arises from the potential for fire or shock. As far as equipment is concerned, a lightning strike can also result in line amplifier loss, leading to whole sections of a cable system in an area going down. Surges on either the power or cable system can also damage a converter or TV set when improperly grounded.

## Transients And Grounding

The converter is the link between two distribution systems: the utility power system and the coaxial cable system. The power system is exposed to transients, or surges, that are induced either by lightning or switching. Switching transients can occur for a number of reasons—recloser, circuit breaker, or other switching operations. Lightning also causes surges on the cable system. In buried cable systems, transients can occur from lightning ground currents.

The potential for lightning-induced transients and resulting damage to cable TV systems is partly a function of the frequency of thunderstorms in an area. There's no section of the United States completely free of the possibility of thunderstorms.

The accepted measure used to protect the cable system from transients is effective grounding and bonding. The operative term here is "effective," as there is increasing evidence that miscon-

ceptions exist in the field concerning what constitutes effective grounding and bonding.

A system is grounded when it is physically connected to the earth. Grounding in an urban house is usually done by connecting to the cold water system, which normally represents a good grounding electrode because of the extensive buried piping system if plastic pipes are not used. The building grounding electrode to which the plumbing, telephone, and power systems are grounded is usually the best ground available.

Bonding, when referring to cable TV systems, is the connection between the grounding electrodes used by the cable TV and the electrical power system. This connection is required if the cable TV system and power system have different grounding electrodes.

The lightning transients that can enter a cable system may last only milliseconds, but they are characterized by very high transient currents and voltages. Voltages can reach into the thousands, limited by insulation breakdowns, with currents of tens of thousands of amperes. The converter parts that sustain the damage are transformers, fuses, transistors, zeners, circuit boards, circuit breakers (requiring resetting), and power transistors. Often, lightning damages the component insulation so that the normal system power then destroys these damaged components.

For instance, in a series of seven decoder failures analyzed by Oak Communications Systems following thunderstorms in one midwestern area, six resulted from transistor/zener failure and one from an open transformer winding. The power transistor was cracked or had the top blown off in three of the units that exhibited transistor/zener failures, and an 18-ohm resistor was destroyed in one other unit.

These four, plus the open transformer winding, were attributed to lightning-induced surges. And each decoder was part of a system that was improperly grounded and was, for all practical purposes, ungrounded. These incidents are not statistical flukes. Oak—as well as other cable manufacturers—have encountered a number of such incidents involving their equipment around the country.

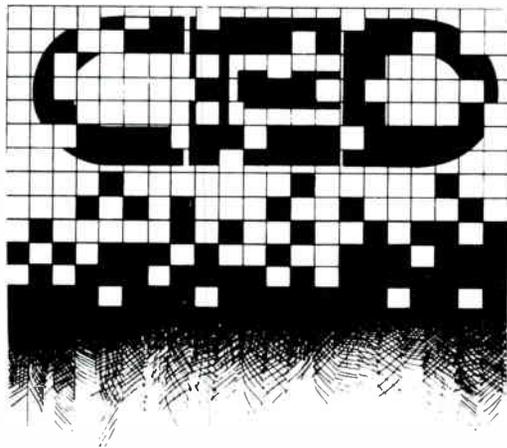
## Grounding Methods

Lightning striking anything is a random phenomenon; height above surroundings increases the probability of being struck. What is certain, though, is that increasing the number of cable TV

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systems increases the probability of lightning damage to such systems because of the increase in the number of miles of exposed cable. The idea, then, is to provide cable TV systems with protection that will reduce, to the lowest level possible, the probability of any one system's being put out of action by lightning.

In grounding a cable TV system, the installer should, at the minimum, follow the National Electrical Code®, which is specific in its recommendation as to grounding electrode to be used and common bonding. Generally, common bonding as specified in NEC (NFPA 70-1981) Section 820 required connecting the cable ground at the subscriber's house to the ground used by the power company. This ensures that when a surge occurs on either the

## Measurement Of Earth Electrode Resistance

Measurement of the grounding electrode resistance usually requires special equipment. When a ground rod is driven into the ground, there is not much point to try to measure the resistance to ground with an ohmmeter, with one lead on the electrode and the other stuck into the ground. The low voltages and currents, and high resistance to ground at the lead that is in the ground, give meaningless results.

The usual method for measuring earth resistance for a ground rod is the three-terminal method. For this method, a small test electrode rod is driven into the ground some distance—100 to 120 feet—from the driven ground rod under test, as figure 1 shows.

A known current, at a frequency other than 60Hz, is injected at the round rod under test and collected at the small test electrode.

The voltage drop between the electrode under test and the earth changes rapidly with distance near the electrode, while the injected current traverses the high-resistance earth about the electrode being tested. A voltage probe is used to measure the voltage between the ground rod under test and the point along the earth's surface where the probe is inserted in the earth.

There is a rapid change in voltage with respect to distance when the voltage probe is inserted into the ground near the rod under test at points between the collecting electrode and the rod under test. That change in voltage with respect to distance becomes almost negligible about midway between the rod under test and current-collecting electrode.

This small voltage change, well away from the rod under test, indicates that the test probe is in a region where there is little voltage drop change. Measuring the voltage between this region and the rod under test provides the resistance of the rod, since the current leaving the rod is known and Ohm's Law can be used.

Ground resistance measuring instruments automatically accomplish the above.

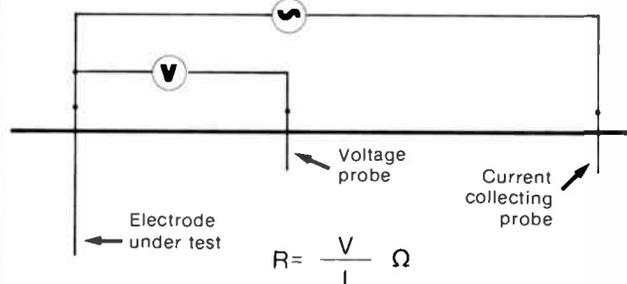


Figure 1 Measuring ground resistance

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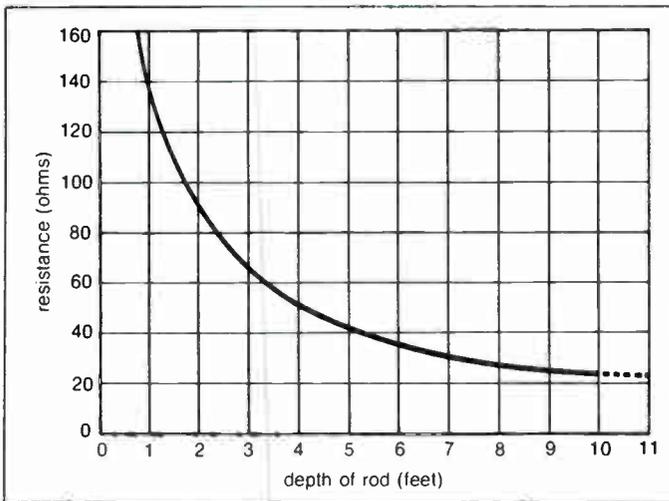
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**Figure 1**  
**Earth resistance decreases as electrode depth increases**

power or cable system, the voltage on both grounds will be the same. Without this bond, if either system were to have its ground system voltage raised by a surge, there could be an arc or fault from one system ground to the other system ground.

In many cable TV systems around the country, existing grounding utilizes an isolated grounding, such as a driven ground rod, connected to the cable sheath where the cable enters the subscriber's house.

Such a grounding electrode should have been selected as specified in NEC. The commonly used driven ground rod is the last choice for a grounding electrode. This electrode should not be isolated but should be bonded to the power company grounding electrode.

Grounding to earth is not as straightforward as it may seem, since the earth is not a good conductor. Resistivity of the medium around the ground electrode can vary, depending on the type of soil and moisture content. The nature of the medium could range from salt water to rock, or a resistivity range of 1 to 10,000  $\Omega$ -m, respectively. The resistivity of salt water is about 10 million times greater than that of copper, for example.

In spite of the relatively high ground resistivities, the earth's



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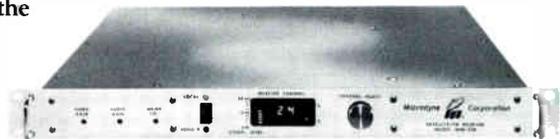
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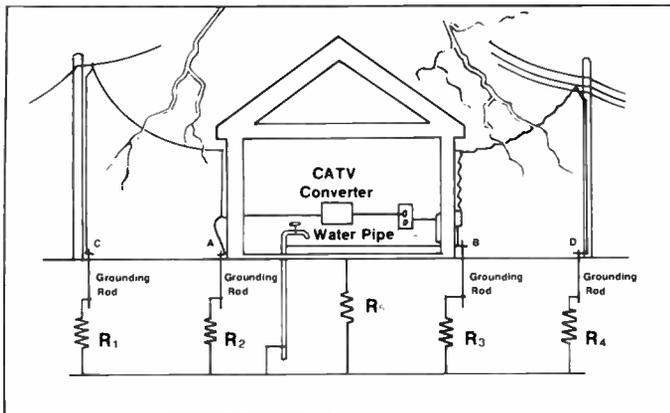


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**Figure 2**

resistance to current is effectively zero, once the current is in the earth, because of its huge size. (A conductor's resistance is inversely proportional to the cross-sectional area.)

Resistance of a ground connection is primarily the resistance caused by the earth immediately around the grounding electrode, where the current enters the earth. NEC Article 250-81 lists these preferred grounding electrodes—that is, those that usually exhibit low grounding resistance:

- A metal underground water pipe in direct contact with the earth for 10 feet or more.
- The metal frame of a building where effectively grounded.
- An electrode encased by at least two inches of concrete located near the bottom of a concrete foundation or footing that is in direct contact with the earth.
- A ground ring including the building or structure.

If none of these systems is available, electrodes listed in NEC Article 250-83 may be used:

- An electrically continuous underground gas pipe system.
- Other local metal underground systems or structures.
- Rod and pipe electrodes (driven ground rods) at least 8 feet long.
- Plate electrodes that expose at least two square feet of surface to exterior soil.

It is important to note that NEC Article 820-22(h) requires a bonding jumper between any separate ground electrode installed for the cable TV system and the building grounding electrode.

## Ground Rod Misconception

A misconception among some cable TV installers, as well as others, is that a driven ground rod provides a low resistance to ground. The resistance exhibited by a driven ground rod, or earth electrode, has three components:

- Metallic resistance of the electrode itself.
- Contact resistance at the surface between the metallic electrode and the earth.
- Resistance of the earth immediately around the electrode.

Of these, the resistance of the surrounding earth is the largest by far, with metallic electrode and contact resistance being much smaller.

It is fairly common for some installers to drive a 4- to 8-foot ground rod in a location with high soil resistivity and then find resistance to ground of 2,000 ohms or more. In some low resistance soil, by contrast, resistance to ground is 5 ohms or less—such low resistance is not common.

A longer ground rod decreases the resistance to earth by about 40 percent when the ground rod length is doubled (see figure 1.) Diameter of the rod has little effect on the resistance to ground, so increasing the diameter does not decrease this resistance significantly.

Care must be exercised in paralleling ground rods to decrease resistance. The schematic in figure 2 shows a typical cable TV subscriber installation without common bonding for the cable TV.  $R_1$  through  $R_5$  represent the resistances to true ground from

individual grounds. For the best protection in this kind of an arrangement, points A and B should be connected to a common water pipe. In this example, even if  $R_2$  and  $R_3$  are about 1 ohm (an uncommonly low value), a 10-kiloampere transient lasting only microseconds can result in a 10-kilovolt transient voltage between the cable TV and power ground. Common bonding ensures that there is negligible voltage difference between the power and cable TV grounds. If the resistance of each of two ground rods to earth is  $R$  ohms, paralleling the two does not reduce the combined ground resistance of the pair to  $R/2$ . The closer the rods are together, the closer the combined resistance of the two rods in parallel will be to the resistance of just one rod,  $R$ .

The actual resistance to ground is not too significant as long as all the grounding electrodes are bonded together. For example, a 10-kiloampere peak lightning current transient in the cable sheath would produce 50 kilovolts on a grounding system with a 5-ohm resistance to ground at the electrode. This voltage could cause an arc or fault over to the power company ground in the converter if that ground were not bonded to the cable ground. The 10-kiloampere peak current used in this example is well below the median peak current of 30 kiloamperes, and the 5-ohm ground resistance is far below the ground resistance usually obtained with a driven ground rod.

All this, of course, is to reduce the hazards posed by ungrounded or improperly grounded cable TV systems. But whatever the situation may be in any given locale, proper grounding and bonding is essential. In short, either you provide the ground or lightning will.

*Theodore Bernstein is a Professor of Electrical Engineering in the Department of Electrical and Computer Engineering of the University of Wisconsin, Madison. He received his BS, MS and Ph.D. degrees from Wisconsin and is a Registered Professional Engineer. He has wide experience as a consultant in electrical and lightning safety, static electricity, magnetics and solid state control circuitry, and has published extensively in these areas.*

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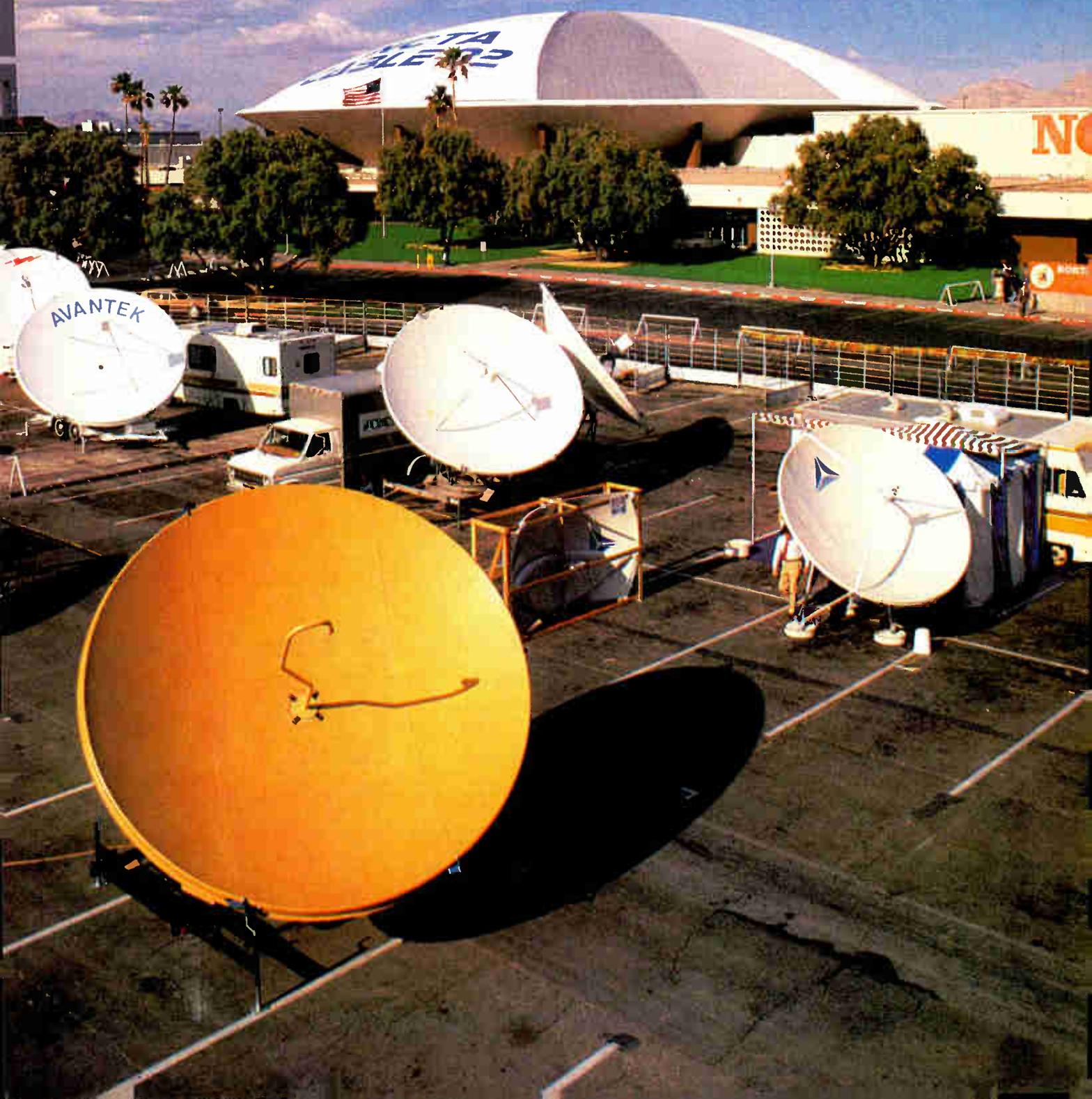
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**NCTA Tech Sessions:**

# **Solutions For The Present, Concepts For The Future**



**For complete information on the technical sessions contact the NCTA Science & Technology Department. They have published a soft cover volume of all the papers that were presented at the NCTA convention.**

The 1982 National Cable Television Association Annual Convention set attendance records with 16,490 in attendance. Amid the flashy presentations, blue sky hype and megabuck deal-making, fourteen technical sessions were held with 58 technical papers offered.

The sessions dealt with such topics as data transmission systems, developments in addressable hardware, fiber optics, studio production, satellite technology, interfacing with consumer electronics, status monitoring, videotex and two-way interactive systems. For engineers on the cutting edge of cable technology and hardware manufacturers committed to the future of cable television systems, the most satisfactory occurrence at the convention was the overwhelming interest shown in data transmission systems and technology.

The first technical session of the convention, *Data Transmission Systems*, was moderated by Robert Tenten of Manhattan Cable. The first speaker was Paul Baran, vice president of engineering for PacketCable Inc. His presentation described PacketCable, a new digital control and communications system that can support high speed, interactive broadband computer communications on both present and future cable systems.

The second paper of this session was delivered by Ernest Tunman, President of Tele-Engineering. The paper offered an excellent detailed overview of future two-way cable television technologies and frequency utilization schemes for optimum spectrum efficiency. Readers who wish to examine the paper are referred to the April issue of this magazine (**CED**, April 1982, p. 16) where it was published.

Robert Dickinson, president of E-Com Corporation, delivered a paper describing solutions to the problem of implementing multiple interactive services on a single cable system. Dickinson detailed a Multiple Service Communications System (MSCS) that has been developed which provides a master control computer or System Communications Controller (SCC) that interfaces with server computers for the various services. At the subscriber location is a Keypad Unit (KPU) that communicates with a Television Control Module (TCM) mounted outside the residence. The TCM employs jamming techniques to control viewing without the necessity of addressability. Another configuration called the Customer Service Module (CSM) provides for various security, fire, medical and utility functions. Configured between the CSM and the SCC computer is an Area Control Unit (ACU). The ACU carries on simultaneous communication with SCC on one side and up to 250 customer modems on the other. The communication protocol is by continuous polling.

Robert McNamara of Sytek Inc., presented a paper describing MetroNet, a synergistic combination of broadband analog, digital and packet switching communication technologies. Following a discussion of market projections to 1990 for value added services over a cable system, McNamara discussed the network architecture of MetroNet which consists of a Data Channel Access Monitor, various network control nodes, user nodes and network interface nodes that provide optional links and gateways.

David Large of Gill Cable TV moderated the *New Developments in Addressable Hardware* session. He commented on the need for more secure scrambling, more links for data base, lower cost equipment and integrated control systems that can handle single dwelling and multiple dwelling units.

Jack Hooper of Oak Communications discussed addressable control for the 1,000 to 8,000 subscriber system. He pointed out

that control center components and software that make addressability cost effective in a 1,000 subscriber system are now available and that with upgradability, a small addressable system meets the criteria for a good investment.

Farouque Mesiya of Times Fiber delivered a paper on the mini-hub system for multiple dwelling units (high rise applications). He discussed the various components of such a system including a central distribution unit, fiber optic links, a residential interface unit and subscriber keypad.

The next session, chaired by David Archer of Viacom Cablevision, covered *Local Programming Facilities Design*. One paper, jointly authored by Don Langley and Jerry Richter representing the University of Cincinnati and Rice-Richter Associates, dealt with "Interactive Split Screen Teleconferencing." This involves the interconnection of two or more remote locations anywhere along the cable television system allowing participants at these locations to carry on face-to-face conversations on a television screen.

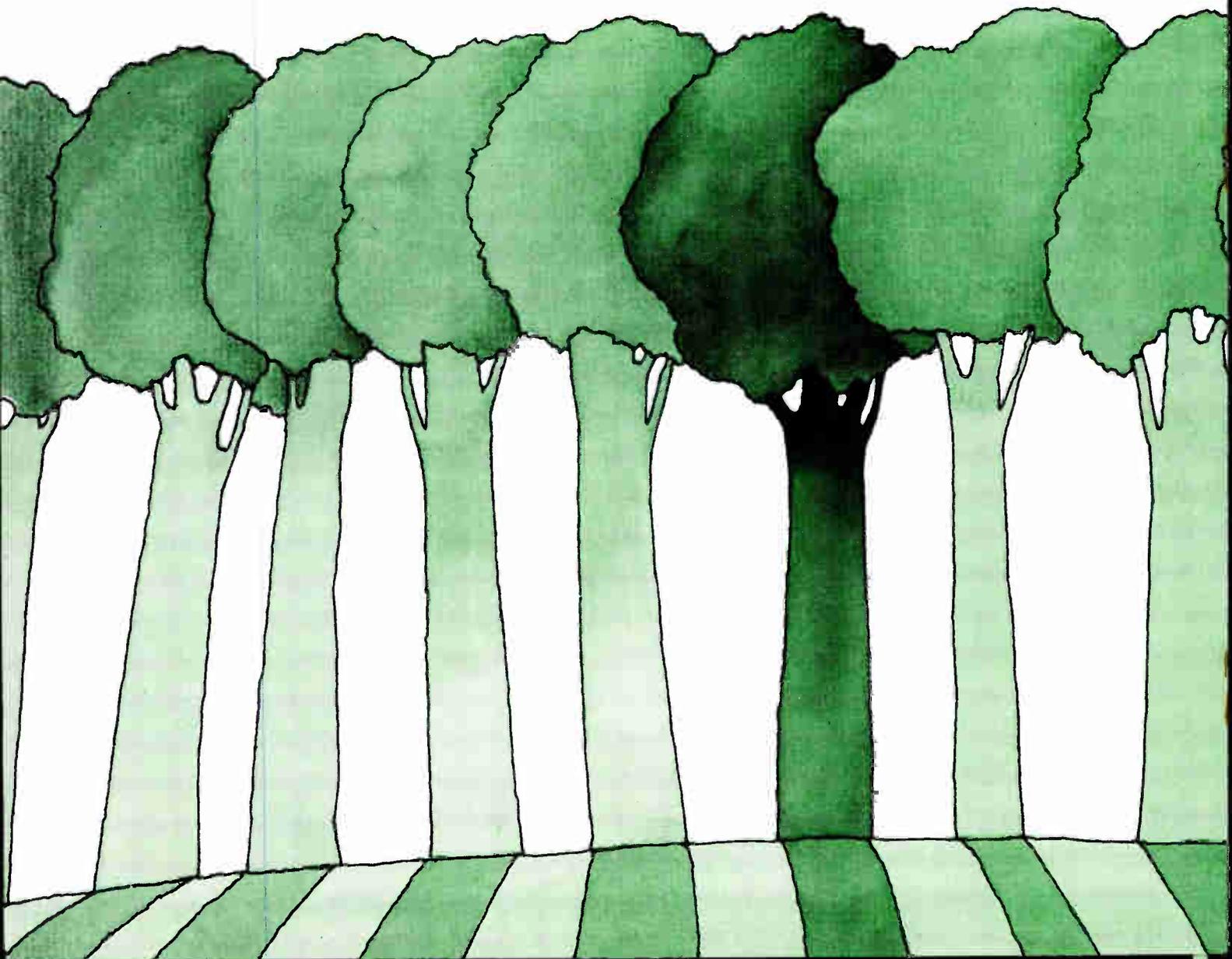
The second of two sessions concerning data transmission, this one titled *Data Transmission Technologies* and chaired by Dr. Gary Tjaden of Cox Cable Communications, was led off by Jon GrosJean who discussed criteria for an optimum modulation scheme for CATV data transmission. After exploring the many trade-offs relative to amplitude modulation (AM), frequency shift keyed (FSK), and phase shift keyed (PSK) modulation schemes, it was determined that for occupied bandwidth requirements either AM or PSK is best with PSK the best for noise performance.

Dr. Stephen Klare, of Scientific-Atlanta gave a presentation on the model 6402 high speed data modem under development. The modem is capable of transmitting and receiving data at standard telephone system rates of 1.544 Mbps (T1) or 6.312 Mbps (T2). Especially important for system operation is the fact that the modem has high bandwidth efficiency and is manually frequency agile. The modulation scheme is Quadrature Amplitude Shift Keying (QASK) which allows for frequency spacing of 750 KHz for T1 channels and 3 MHz for T2 channels with a bit error rate of less than  $10^{-9}$ .

The next speaker in this session was Abe Sonnenschein of Hughes Aircraft Company's Microwave Communications Products Division. He described microwave data transmission using AML techniques. After thoroughly detailing the nature of an Amplitude Modulated Link (AML), Sonnenschein went on to discuss various modulation schemes used in video, voice and data transmission. The primary thrust of his talk was that the AML system can accommodate virtually any analog or digital signal capable of being carried on conventional cable system and does so preserving all incoming modulation forms and spectral relationships.

The concluding speaker in this session was Jay Jubert who discussed Wangnet, a cable-based localnet. As described by Jubert, Wangnet is a protocol independent business data network dedicated to broadband institutional cable. Using a spectrum allocation of 340 MHz, multiple services are provided in four major groupings: utility band, interconnect band, Wang band and peripheral attachment band. The utility band is for video and is transparent for many RF users while the Wang band interconnects Wang computers and word processors. The interconnect band allows for connection of computers and other equipment of differing protocols and standards. The peripheral band is used to connect printers and remote work stations to host computers in an office environment. Gateway is possible to other

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### **First, look at the hardware.**

The heart of addressable hardware is the computer. So you can't afford anything less than the best. That's why Oak addressable systems use an IBM Series 1 computer. It's famous for its reliability and nationwide sales and service backup.

In subscriber terminals, look beyond pretty cases and into performance. Look for things like a "favorite channel" memory for fast, easy tuning, parental control and durable membrane keyboard entry.

Finally, make sure everything's covered by a full year's warranty. That way you won't get caught out on a limb.

### **Look at software performance.**

See if it offers modular programs for you to pick and choose the kind of input and output you need. You want a system that takes into account versatile record access, allows entry to common menus with a single keystroke and interfaces with your billing system for highly efficient and accurate operation.

Make sure you and your software speak the same language.

Your addressable system should have a simplified design with plain English menus, so your own people can be trained to use it quickly.

### **Finally, find the right suppliers.**

Talk to someone who's thoroughly experienced in designing and building everything from 35 to 56 channel converters/decoders, and one- and two-way addressable systems. That way you'll get exactly what you need.

Only Oak Communications Systems (formerly Oak Communications CATV Division) has everything you're looking for in an addressable system. Backed by over 15 years in the cable TV business, Oak invented and introduced state-of-the-art addressability and has a proven track record of having the most addressable systems in operation in the U.S. today.

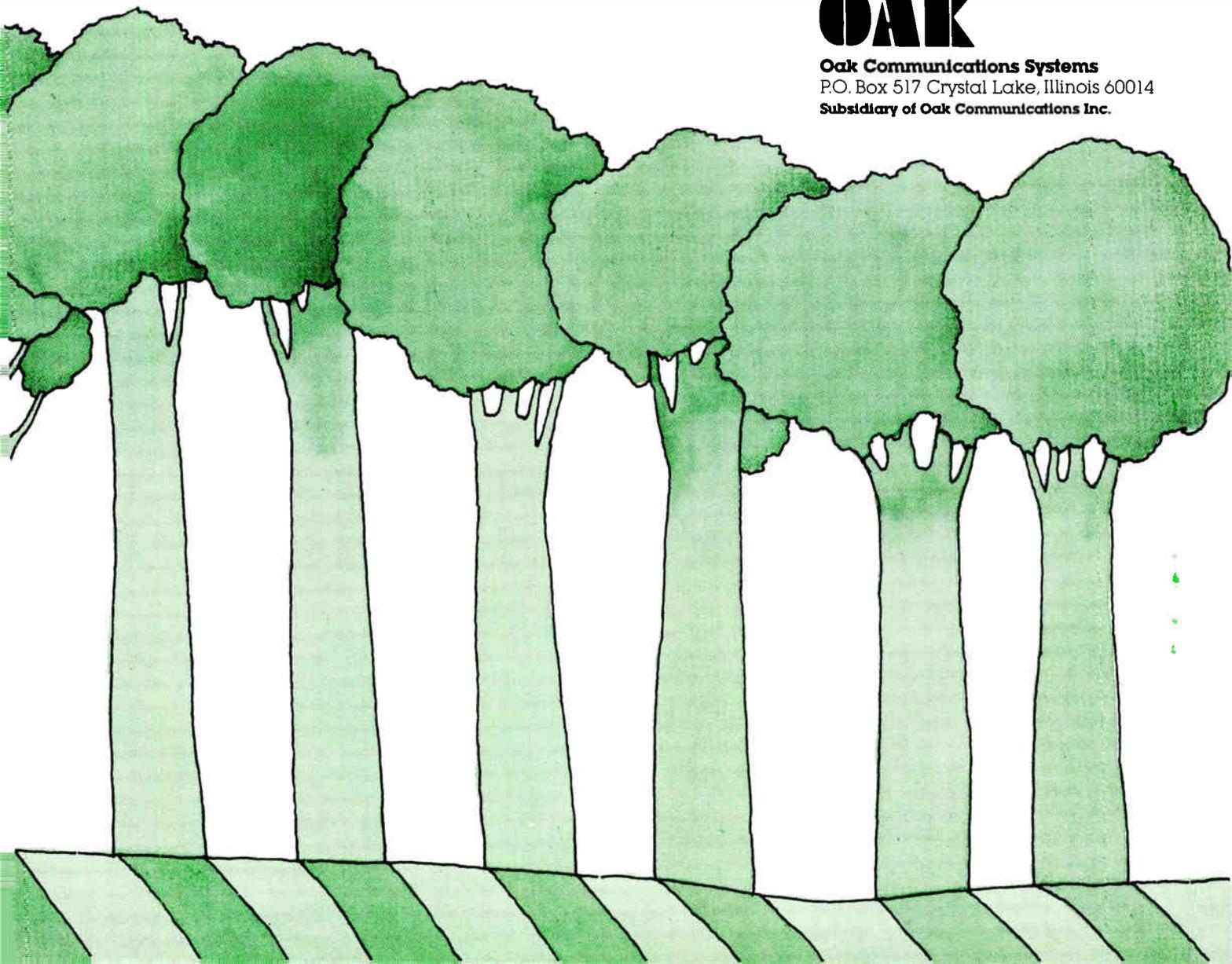
### **Now, here's how to get started.**

For more information on Oak addressable systems, dial our toll-free phone number: 800/323-6556 (in Illinois 800/942-6345). Remember, when you buy an addressable system from Oak, you never have to worry about being lost in the woods.

**Oak: The first choice in addressability.**

# **OAK**

**Oak Communications Systems**  
P.O. Box 517 Crystal Lake, Illinois 60014  
**Subsidiary of Oak Communications Inc.**



# Coax-Cablecon® cable-in-duct system for CATV trunk, feeder and drop lines installs quickly, saves \$\$\$\$.



Coax-Cablecon duct is extruded over single, dual or multiple coax cable. Duct protects coax during shipment and in the ground.



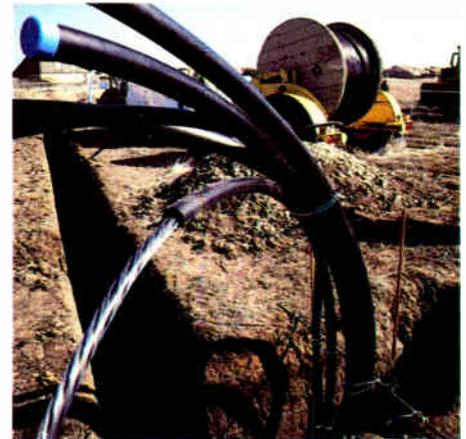
Coax-Cablecon makes for a fast installation: it arrives at your job site on reels, pre-cut to 1200 or 2400-foot lengths. Small back-lot tractors can plow-in Coax-Cablecon up to 60% faster than other in-duct buried systems: in-field demonstrations have averaged 60-feet per minute in medium density soils.



Coax-Cablecon can be plowed-in or laid in open trench if soil will not accept cable plow. Either way, continuous one-piece Coax-Cablecon beats hand work required with metal or PVC duct.



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



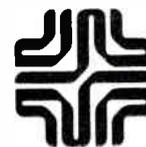
Cablecon has been thoroughly proven since the 1960s in utility distribution, street and highway lighting applications. Coax-Cablecon is manufactured specifically for the CATV Industry.

Integral Corporation Coax-Cablecon Sales Department  
 P.O. Box 11269 Dallas, Texas 75223, Phone: (214) 826-0590  
 Please send me information on Coax-Cablecon.

CED 6/82

Name \_\_\_\_\_  
 Company/firm \_\_\_\_\_  
 Address \_\_\_\_\_  
 City/State/Zip \_\_\_\_\_  
 Phone \_\_\_\_\_  
 single or  dual cable system  trunk  feeder  drop line

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**Integral Corporation**

Telecommunications Division

Wangnets or individual information users.

Dean Popp of Communications Technology Management chaired the session on *Satellite Technology and Microwave System Design*. The first speaker, Marvin Mason of Metrovision Inc. discussed profiling microwave paths using a Radio Shack Level II BASIC computer and an Okidata 83A printer. He also described a program that allows operators to compute microwave paths in considerably less time than the hand plotted method.

The next speaker, William Johnson of Microwave Filter Co. Inc. talked about earth station filtering and the proper application of filters in microwave and/or intermediate frequency signal paths. Johnson warned that filters are not a panacea for in-band or out-of-band interference transmissions but that they could help where other applications have failed.

The next session titled *Interfacing CATV With New Consumer Electronics Products* was chaired by Joseph Van Loan of Viacom Cablevision. Gerald Bahr of Cox Cable Communications, was the first speaker and discussed cable-ready TV sets from an operator's viewpoint. For the cable operator with cable-ready sets in the homes of subscribers, an expansion of channel capacity will be less costly since the sets require no converters.

The following speaker was Sruki Switzer, a well known and respected expert in cable television. Addressing TV receiver compatibility problems and the seeming lack of awareness of the changes occurring in the cable industry on the part of consumer electronics manufacturers, Switzer pointed out that cable-ready sets are by no means ready for the cable systems being designed and built today.

Switzer, as forthright and controversial as ever, described what he sees as a tug-of-war between the cable operators and TV receiver manufacturers, with manufacturers seeking ownership of equipment by subscribers and cable operators wanting control of the equipment that goes into the home in order to maintain flexibility in their systems. Switzer came out strongly for subscriber ownership and a shift away from scrambling or coding of signals for security of service. Concluding his talk, Switzer departed from his prepared paper to say, "For cable television, whether we are willing or not, that is the way this society, this economy, and the regulators are going to go, and that is to subscriber ownership of equipment. And in our view, the sooner the better."

Robert Rast, with the RCA Labs for 10 years and now with ATC, talked about the Joint Electronics Industry Association, NCTA Engineering Committee that he chairs. Because the focus of the charter is, "to establish and maintain dialogue between the cable and consumer electronics industries for the purpose of studying and resolving engineering matters of common interest," Rast urged three things: 1. establish communication in a two-way mode, 2. find out how we can cooperate, and 3. seek opportunities for standardization.

The session on *Videotex on Cable: Is the Technology Here?* offered four speakers who detailed developments at the current state-of-the-art. The first paper was presented by Michael Dufresne of Videotron Communications, Montreal, Canada. Dufresne discussed VIDACOM, an integrated communications system based on broadband digital transmission.

The next session, moderated by Ann Muller of CTIC Associations of Arlington, Virginia, was on *Control of Noise and Distortion in Distribution Systems*. The first speaker was Sruki Switzer. He discussed his experience with designing head-end synchronized video.

Switzer commented on high definition television (HDTV) and pointed out that with the increased sensitivity to distortion and the 25 MHz IM will mean that carrier-to-noise ratio will be even more critical in systems of the future.

The next paper, "CATV System Return Path Interference," was presented by Harry Reichert of General Instrument Jerrold Division. He discussed common path distortion and defined a method for locating the source of the distortion.

# EAS ELECTROLINE'S ADDRESSABLE SYSTEM

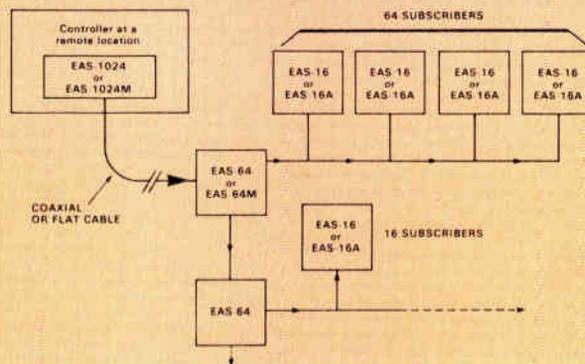
**A cost-effective system offering maximum security with ease of control for multi-unit buildings.**

## EAS

Designed to control access or premium service to subscribers in multidrop buildings. The system is modular in

design. Security is maintained by means of continuous scanning. EAS is ideal for apartments, hotels, hospitals or other such location where constant control is needed and to provide visual audit of each subscriber's status.

### ADDRESSABLE SYSTEM



## EAS

The above system is composed of 3 units — a microprocessor control (EAS-64); and a wide-band, multitap switch assembly (EAS-16). The system can be installed in 2 alternative configurations and is most compatible with other systems.

*Illustrated folder with specifications upon request.*



## ELECTROLINE Television Equipment Inc.

8750, 8th Avenue, St-Michel  
Montreal, Que. H1Z 2W4

or phone **collect**  
(514) 725-2471

Representatives across  
Canada and the U.S.A.

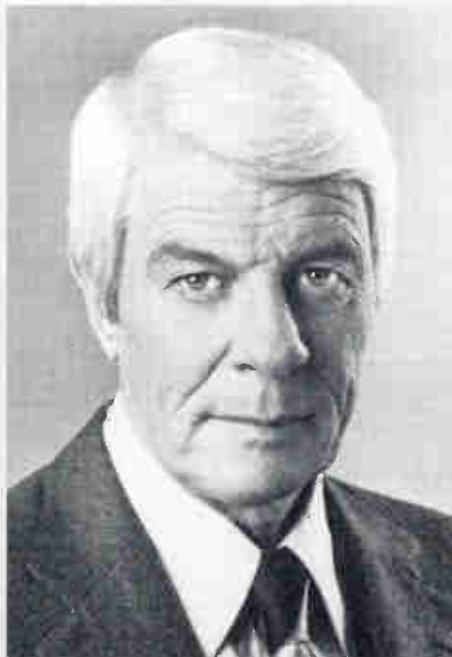
- TAPS
- FILTERS
- COUPLERS
- SPLITTERS
- SPECIAL AMPLIFIERS
- SWITCH-TRANSFORMERS

# STOP! LOOK! LISTEN!

**STOP!** Don't make a decision on a one-way addressable system until you talk to Pioneer. **LOOK!** Examine the Pioneer solution to your needs for one-way addressability. **LISTEN!** Hear what our customers are saying about Pioneer quality and service. Then listen to our competitors' history with their addressable products.

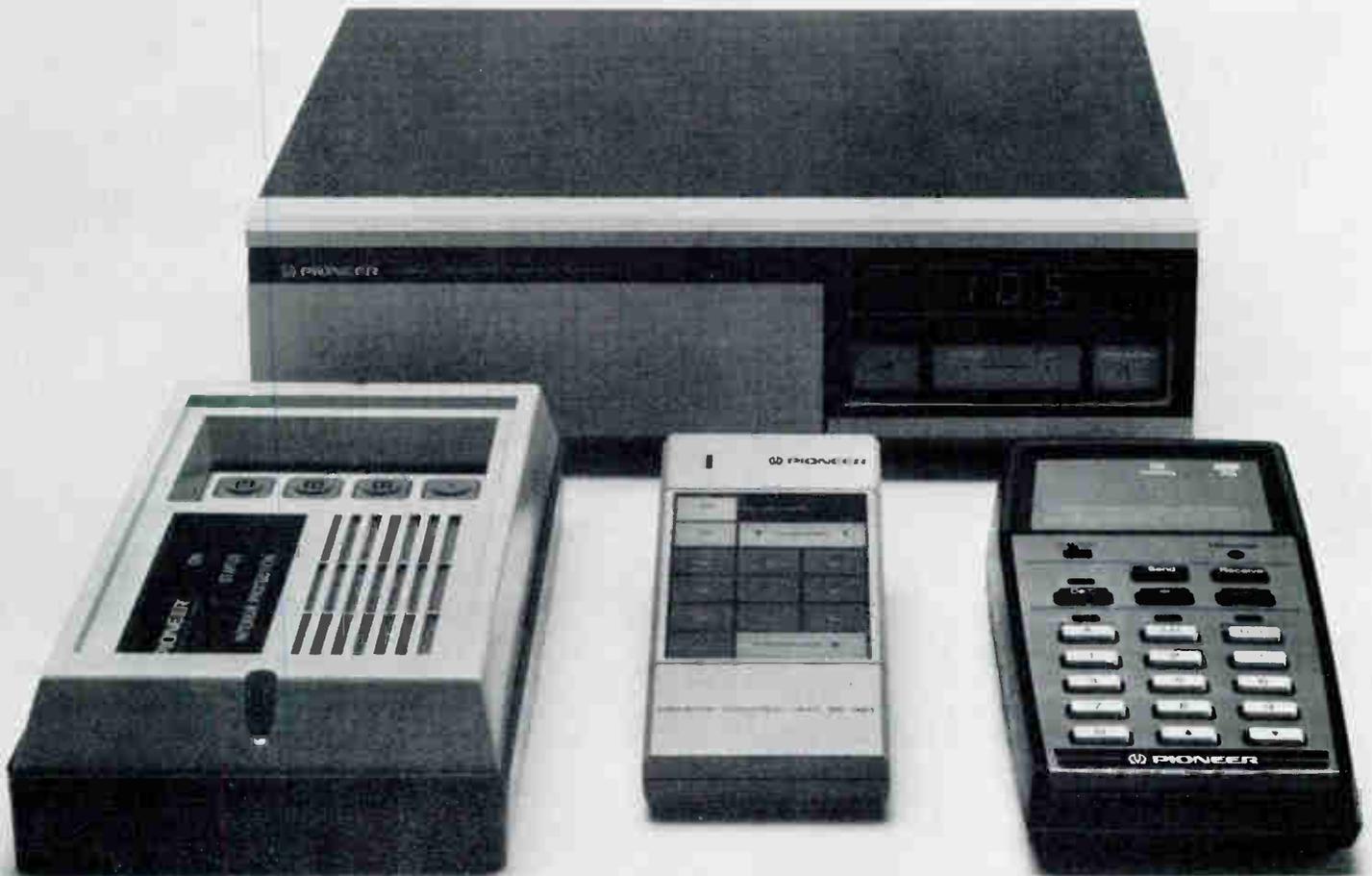
## What makes Pioneer's VIP One-Way Addressable System superior?

■ Over 4 years experience with field proven addressable technology; experience you can trust. ■ 42 single controllable channels. This means you can configure channels and groups of channels the way you want. ■ The industry's most powerful anti-theft, anti-tampering features, the result of our years of experience with two-way addressability. ■ Hardware and software easy for you, the operator, to use. ■ Easy to use subscriber terminal. (Remem-



ber Pioneer has been successfully making consumer products for many years.) ■ The One-Way Addressable terminals are mixable with Pioneer's popular BC-2000 and 3000 Series converters. ■ As a part of the Pioneer VIP System, the One-Way Addressable technology is one phase of a total systems approach to addressability. ■ Guaranteed long-term product availability, so you'll not be left with obsolete terminals. ■ Pioneer's record for keeping delivery and service commitments. You can depend on us. ■ Priced competitively with other one-way systems of lesser quality. Service calls defeat the purpose of these systems, so quality and flexibility should be the number one deciding factor.

These facts are only a few of the reasons to be sure you stop, look, and listen to Pioneer before you buy. Call us today for all the facts.



 **PIONEER®**

PIONEER COMMUNICATIONS OF AMERICA, INC.

2200 Dividend Drive Columbus, Ohio 43228 (614) 876-0771

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# Tech Review

## **Addressability**

ABC/Cox Cable  
Eagle Comtronics Inc.  
Gill Management Services Inc.  
Sylvania CATV  
Magnavox CATV Systems  
Oak Communications Systems  
Picneer  
Scientific-Atlanta  
TCCOM Inc.  
Winegard CATV

## **Cable**

Scientific-Atlanta

## **Construction Equipment**

Ben Hughes Communications Products  
Ditch Witch  
Gilbert Engineering  
Magnavox CATV Systems  
Ripley Company Inc.  
Tyton Corporation

## **Distribution Amplifiers**

Broadband Engineering  
Century III Electronics  
GTE Products Corporation  
Magnavox CATV Systems  
TRW Semiconductors  
Winegard CATV

## **Earth Stations**

Andrew Corporation  
Harris Corporation

## **Enclosures**

Channel Commercial Corporation

## **Headend Components**

Comtech Data Corporation  
Phasecom Corporation  
RCA Cablevision Systems

## **Home Security**

ADT Security Systems  
CableBus Systems Corporation/Colorado Electro-Optics  
Scientific-Atlanta

## **Pay TV Devices**

Intercept Corporation  
Jerrold

## **Power Supplies**

Alpha Technologies

## **Satellite Receivers and Components**

Automation Techniques  
Avantek Inc.  
Microdyne Corporation  
Newton Electronics Inc.

## **Set Top Converters**

Jerrold  
Magnavox CATV Systems  
Octagon-Scientific/Regency Electronics  
Kanematsu-Gosho  
RCA Cablevision Systems  
Synchronous Communications Inc.  
Zenith Radio Corporation

## **Test equipment**

Biddle Instruments  
Sadelco Inc.  
Tektronix Inc.  
Wavetek Indiana Inc.

# Look into the new Sylvania converter and you'll see the future.

Operator programmed Channel Inhibit will eliminate both audio and video on any or all channels.

Built-in software provides for later addition of a Subscriber Response option for up to 100 separate response entries.

Brown-out protection restores converter operation even after line voltage drops below 102 VAC.

Light touch, spill-proof keyboard has a shield to protect the microcomputer against static electricity.

In-band descrambler has a field-proven sync suppression method and can descramble any or all channels.

Plug-in modular design allows you to change options without soldering or unsoldering wires.

Wireless remote control option will perform all functions except security code entry for channel inhibit.

Constant current generator insures no loss in remote control functions until the battery is exhausted.

In the future, you'll be able to add an addressability option that lets you control subscriber's service from a central office.

When you select a converter, you shouldn't just ask what it can do for you now; you should find out whether it will keep up with the changing needs of cable television tomorrow.

Look into the Sylvania 4040 Set Top Converter and 4042 Wireless Remote Control. This handsome, ruggedly built 400 MHz programmable unit uses low-power microcomputers for all functions like no other unit on the market.

Your customer may store and recall 16 favorite channels, clear entries made by mistake, and change channels one step at a time with a single button.



The Wireless Remote and Set Top Converter is designed to last well into the future, too, with built-in surge protection and a large heat sink to keep the Set Top unit cool. The digitally-controlled, phase-lock loop frequency synthesizer eliminates the need for fine tuning.

For more information, contact your local Sylvania CATV sales office, or phone toll free (800) 351-2345 within the continental U.S., except Texas. From Alaska, Hawaii and Texas, call (915) 591-3555 collect. In Canada, call our distributor, Micro-Sat Communications at (416) 839-5182.

This is a converter that really has a future.

**SYLVANIA**

CATV  
Transmission Systems

**GTE**

**Addressability**

**ABC/Cox Cable**

**ABC Video Enterprises Inc. and Cox Cable Communications Inc.** announced a joint venture at the 31st annual NCTA convention that will examine the full range of entertainment and information programming, including pay-per-view, video games, videotex and transactional services.

According to a news release, the venture will concentrate on the development of programming and hardware for one- and two-way addressable systems. In its first phase, the new undertaking will evaluate a number of one- and two-way programs and services in certain Cox cable systems and other selected major cable operators.

Both sides expressed confidence in the new venture and indicated that they would be moving aggressively toward the future of interactive services.

According to the release, an immediate focus of the new venture will be extensive research into consumer and cable operator attitudes, evaluation of hardware capabilities and headend configurations best suited for addressable product delivery, and determination of appropriate billing systems.

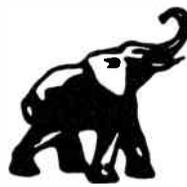
**Eagle Comtronics Inc.**

According to national sales manager Chester Syp, **Eagle Comtronics Inc.** 15-tier addressable descrambler (models AD-2, 3 and 4) is unique in that sync restoration is in the video not on the audio. No added system degradation or critical AML alignment is required. The descrambler is under computer control (the first, says Syp, to use the Northstar-Horizon mini-computer) and can decode any pre-determined pay-TV channel or group of channels in a programming tier.

The 15-tier addressable descrambler also enables complete computer control of up to 15 tiers of channels, with the same in-band suppression technique used to scramble all 15 tiers. The headend computer system controls the length of viewing time for each pay-per-view program and handles each subscriber's multiple viewing requirements.

The headend scrambler has a rack mounted mainframe with self-contained power supply holding up to three scrambler modules. The package fits into existing racks and interfaces with three separate channel modulators or processors. The Eagle scrambler modules are compatible with any HRC, ICC, or standard system configuration.

For more information contact Eagle Comtronics Inc., 4562 Waterhouse Road, Clay, N.Y. 13041, (315) 622-3402 or (800) 448-7474.



**Elephant Industries Inc.**

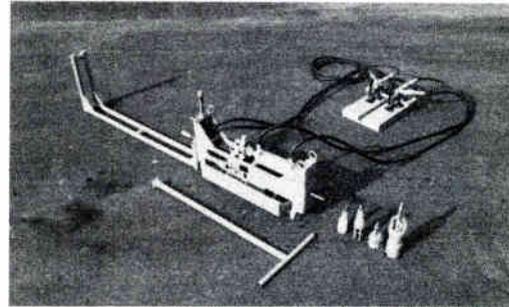
Presents

**"The Driveway Special"**

Specially designed for the Cable TV Industry.  
The answer for small bores up to 4 inches.

Compact and powerful!  
Weighs only 199 lbs.  
Two men can handle easily!  
Trench needed: 6 in. x 6 ft.  
6 in. with 3 ft. rods.  
The EIM-DS4 develops 31,416 lbs. of pressure at 2,500 PSI.

Hydraulic gates lock Elephant into trench.  
Great for more difficult soil conditions.  
Pulls 1 in. to 4 in. pipe at 8 feet per minute.



**EIM-DS4**

**Elephant Industries Inc.**

PH: 813-995-7383  
813-995-0024

P.O. Box 3626, 3949 N. U.S. 41  
North Ft. Myers, FL U.S.A. 33903

**We Are Sound!**

Quality satellite audio is a profitable cable support service — if it's done right. That's why the WEGENER Series 1600 main frame satellite audio system was developed — with lasting quality and flexible economy to add each great satellite audio service card-by-card.

WEGENER developed quality stereo and mono especially for satellite, and our guaranteed specs insure audio performance unequaled by anyone. That means more satisfied subscribers.

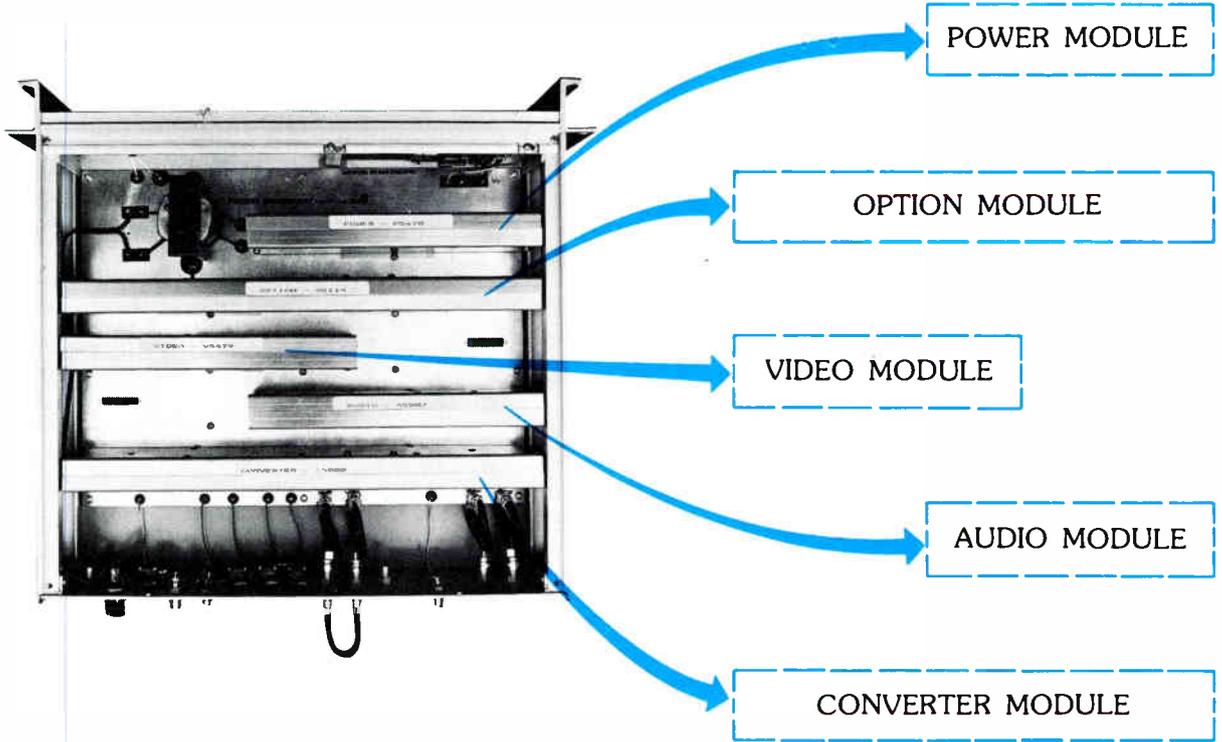
Call today and we'll ship right away. Don't wait to hear about us, listen to our sound Series 1600 system today and discover that at WEGENER **We Are Sound!**

**Wegener Communications Inc.**

150 Technology Park/Atlanta Norcross, GA. 30092  
**1-404-448-7288**

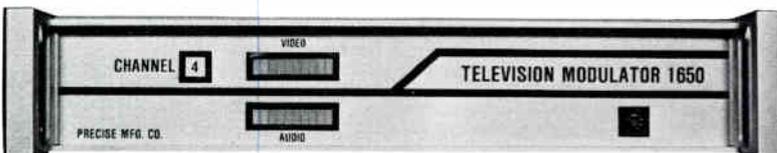
introducing

# 1650 MODULATOR 1700 PROCESSOR



Our equipment has many impressive features, such as **SAW bandpass filter**, double balanced mixer, crystal controlled picture and sound carrier, and output converter. However, the actual heart is the **Modular Design** used in equipment construction.

All output channels and options are modular and easily changed or replaced within minutes. Our free module **Exchange Program** during the 2 year warranty period makes it the best in the industry.



#### OTHER NOTEWORTHY FEATURES:

- Internal RF bandpass filter
- IF modulation
- Unique LED readout



#### PRECISE MANUFACTURING CO., INC.

2219 South 48th Street  
Tempe, AZ 85282  
(602) 967-0030

**Gill Management**

George Neuman, manager and market planner for **Gill Management Services Inc.** said, "What we're offering now is the opportunity for cable operators to put in addressable converters without being locked in forever."

The new feature that allows GMS to offer that opportunity within its computer systems is the multiple control device. As Neuman explains, operators can get stuck relying on one line of addressable converters. The new feature supports multiple manufacturer devices simultaneously.

In addition, the GMS system links control of the addressable device directly with the billing system. Once premium services are ordered and the device is programmed, subscribers are automatically billed for pay-per-view events or channels delivered. It also registers all equipment transactions, providing up-to-date inventory analysis.

The multiple device control aspect of Gill's computer systems is now in use with the Gill Cable System in San Jose, California, currently operating with 92,000 subscribers.

For more information contact Gill Management Services, (408) 998-8078.

**Sylvania CATV**

GTE Products Corporation, **Sylvania CATV Division** announced the introduction of a CATV addressable system at the NCTA convention in Las Vegas.

The system's components include the model 5303 addressable controller which controls up to 20 model 5304 modems, and together will handle up to 200,000 subscribers. Additional controllers and modems can be used to expand the system beyond 200,000 subscribers. Each modem will process commands at the rate of 1,000 subscribers per second.

The model 4050 addressable module and model 4051 reply module receive and send commands and may be either factory installed or can be field upgraded to the model 4040 58-channel converter introduced in the summer of 1981. The addressable system is expected to be in production early 1983.

For more information, write to customer service, 10941 Pellicano Drive, El Paso, Texas 79935 or telephone (915) 594-3555.

**Magnavox CATV**

**Magnavox** has introduced a status monitoring system, the Magnavox Digital System Sentry™ (DSS). DSS is a multi-function system designed to assist the maintenance and operation of cable systems.

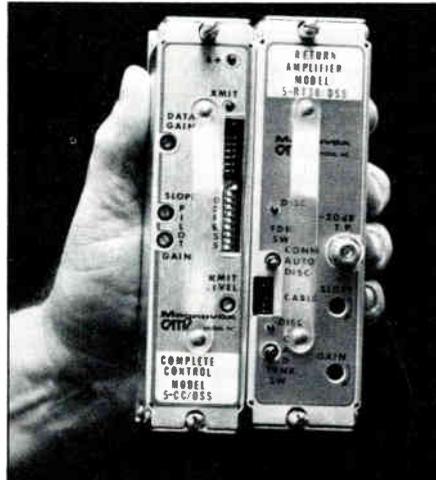
Using a centralized computer base, DSS monitors each trunk amplifier within

a system, and reports its status. System troubleshooting can be accomplished from the headend so the amount of manual trial and error effort is minimized.

According to the company, benefits of the DSS system include: reduction in return noise funneling; minimized customer complaints; decrease in costly repair time; and minimum potential for liability problems.

Features of the DSS include: status of DC power supply; forward level and return level reports; return feeder and return trunk switching; 6 dB pad switch; audio fault alarm; and upgradability.

For more information contact Magnavox, 100 Fairgrounds Drive, Manlius, N.Y. 13104, (315) 682-9105.



*Magnavox Digital System Sentry*

**Oak Communications Systems**

**Oak Communications Systems** introduced the MiniCon 2, including Oak's interfaceable addressing system software and the IBM 5150 personal computer at the NCTA show.

MiniCon 2 is designed to increase revenues and reduce operating costs for the small system operator. Likewise, the IAS capabilities of MiniCon 2 will allow the small system operator to link up with a remote billing computer.

Oak IAS links the IBM computer in the operator's office to a remote business management computer. All data is input once to the host, which collects subscriber data and transmits control information to the MiniCon slave via a direct communications link.

MiniCon 2 increases the number of system functions from 6 to 13, including new activities and access options, to provide increased control of the system. It also allows a small system operator with a decoder base of 10,000 or less to enjoy the major advantages of addressability at a substantially lower cost than larger total control systems.

For further information contact Oak Communications Systems, P.O. Box 517, Crystal Lake, Illinois, 60014, (815) 459-5000.

**Pioneer**

Announced in March, 1982, the **Pioneer** one-way addressable converter was Pioneer's featured product at the NCTA convention. Made for the operator who wants to take the first step in addressability, whether in systems with 2,000 or fewer subscribers or those with many thousands, the converter itself is housed in a steel box, which, according to marketing director John Lanpher, is virtually tamper-proof. In case of break-in, the converter automatically shuts off.

The hand-held control unit has LED display and membrane pushbuttons capable of activating over 100 channels. The converter is essentially the same unit provided by the company for Warner Communications' QUBE systems.

The small or starter system (for 1,000 terminals or less) utilizes an Apple computer that provides the same functions as larger computers at lower cost. For a system with 2,000 or less subscribers the price of hardware and software combined is about \$60,000. Digital Equipment Corporation computers, one for each increment of 15,000 subscribers, are made available to accommodate larger systems. The converters alone are priced from \$115 to \$140, depending on quantity and system design. Pioneer also makes a two-way addressable converter, VIP security and plant monitoring systems.

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



*S-A addressable 8500 set top terminal*

**Scientific-Atlanta Inc.**

**Scientific-Atlanta Inc.** is now offering equipment needed to address programs to U.S. cable subscribers via satellite. The new addressable-by-satellite system is designed to control addressable terminals in any number of CATV systems nationwide from a single computer located at a central or regional satellite transmitting site.

Authorization instructions are intro-

# NOBODY SCRAMBLES LIKE ZENITH.

**Introducing Z-TAC, with the security of 5-mode scrambling.  
A multi-tiered, 54-channel, fully addressable  
converter system with remote volume control.**

*The Z-TAC scramble is secure. The scramble is not only 5-mode, you can make almost limitless variations at the encoder. It's designed to lock out unauthorized viewing and assure maximum revenues. Z-TAC is truly format agile.*



5-MODE BASE BAND SCRAMBLING

*The Z-TAC system offers 20 categories of services that will allow control of all 54 channels. Tiering allows customers to put together,*

and change at will, a selection of program categories. Decoders are authorized by signals from the encoder.

*Z-TAC offers full head-end addressability.* Each decoder has its own individual address consisting of a market code and a subscriber number. Both are part of the decoder's unique memory. Market code prevents the functioning of a decoder moved to another system. Decoders which have been lost, stolen, or are of no-pay status are addressed OFF.

*The Z-TAC system also has these innovative options.* Remote dual A-B Switching. Z-ALERT emergency signal. Redi-Plug output for connection with monitors, interactive two-way modules and Z-TEXT. BASE-TAC-Video-output unit for monitor applications. TAC-ALONG, Stand Alone TAC addressability for existing converter systems.

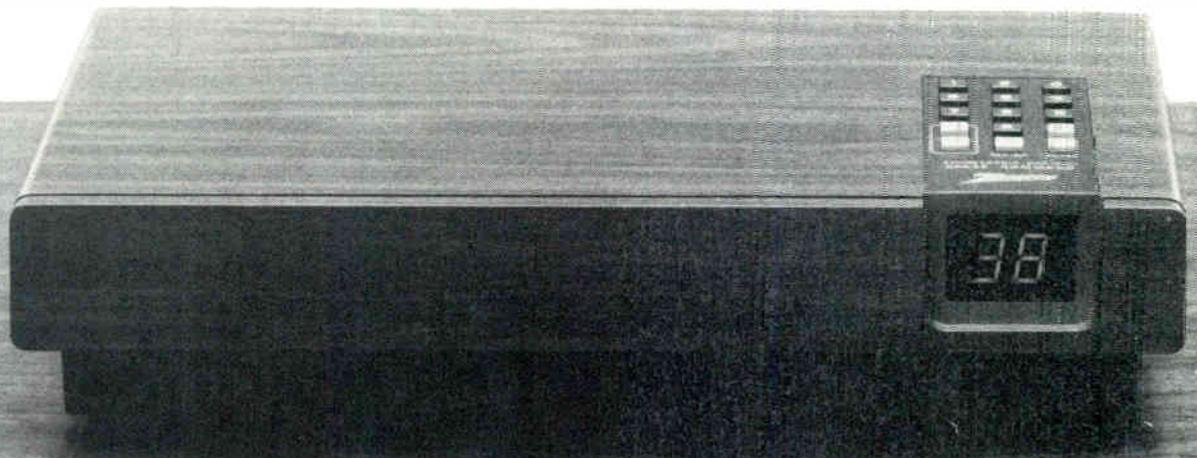
Z-TAC offers cable operators the most advanced converter system available, plus Zenith reliability and service. For complete information, contact: Zenith CATV sales, 1000 Milwaukee Ave., Glenview, IL 60025 Phone: 312-391-7600.

COMPUTER  
SPACE COMMAND  
WITH REMOTE  
VOLUME CONTROL



**ZENITH**<sup>®</sup>

THE QUALITY GOES IN BEFORE THE NAME GOES ON.



# How to offer tomorrow's services with today's equipment

## Offer two-way transmission.

Hughes AML delivers video and data in both directions for local origination, institutional and subscriber interactive services. And AML also accommodates the latest multiple tier and addressable converter scrambling systems.

## Offer expanded services.

Whether it's a new build or a rebuild AML helps you satisfy the toughest franchise requirements as well as generate added revenue. You can lease data channels to commercial users and provide local loops for satellite data networks. You can also use



AML for security systems, teleconferencing and traffic light control. In addition to delivering high quality video signals, AML offers the perfect system to access data banks and computer time share services.

## Offer the newest improvements.

Even if you have our first 12 channel model introduced in 1971, you can upgrade to provide all of the expanded services above and more. Any AML can be retrofitted with 440 MHz bandwidth, single or dual 60 channel capac-

ity and receivers with noise figures as low as 7 dB. Upstream transmission is easily added to existing one-way systems. AML is one of the few things in this world designed to improve with age.

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: Micro-Sat Communications, Ltd., 975 Brock Road South, Pickering, Ontario Canada L1W3A4, (416) 839-5182.

*NEW  
AML system designs  
provide more than 160 channels*

**HUGHES**

HUGHES AIRCRAFT COMPANY

duced at the main computer and converted to a digital format. The digital message is transmitted at 56 kilobits per second on single-channel-per-carrier (SCPC) equipment, permitting up to twenty carriers on any satellite transponder without interfering with video transmission.

The primary components of the Scientific-Atlanta addressable-by-satellite system on the transmit side are a mainframe or distributed processing computer system, an intelligent control unit (ICU), a multiplexer, a digital modulator and associated earth station transmit equipment. The receive side includes a standard satellite earth station, a digital demodulator, a demultiplexer and an intelligent transmitter (ITR). In the home, Scientific-Atlanta's 8500 set-top terminal selects and displays the programs which are addressed to it.

Scientific-Atlanta is working with Telecommunications Inc. to install a pilot system in Denver, Colorado.

For additional information contact Scientific-Atlanta, subscriber products division, (404) 925-5561.

#### **TOCOM Inc.**

**TOCOM Inc.** has announced a new way for cable television operators to

deliver pay-per-view programming with a one-way addressable converter, without having to use a tiering structure. This new technique, called "subscription programming," is now a standard feature on all TOCOM 55 PLUS addressable systems.

Unlike other addressable techniques that use tiering to control pay-per-view, subscription programming is specifically designed to allow the sale of individual premium programs, or series of programs, to the subscriber. Because subscription programming doesn't require any interactive transmission, the technique is suitable for immediate use in any one-way cable system.

Each 55 PLUS addressable converter can be authorized to receive up to four separate subscription programs in addition to the packaged services (tiers) that it normally is enabled to receive. The system can support 256 subscription program ID numbers on each channel, giving an almost unlimited capability to deliver pay-per-view programming.

The TOCOM 55 PLUS addressable system also offers immediate response, interactive pay-per-view with the 5510A home information terminal. Both the 5504A one-way converter and the 5510A two-way converter can be used individually or together with the same cable

headend—the 55 PLUS programming control system. Both 55 PLUS converters are intelligent, addressable "set-top" processors which deliver high-quality 400 MHz frequency conversion and baseband descrambling. Each converter can provide 110 channels of programming on a dual cable system.

For more information contact TOCOM, (214) 438-7691.

#### **Winegard CATV**

**Winegard CATV Division** announced at the NCTA Convention its new addressable converter/descrambler as well as a new series of 450 MHz sub-split modular amplifiers.

The addressable converter/descrambler provides digital tuning and is programmable to operate on either standard, HRC or other custom picture carriers. An eight-channel memory is built in for favorite channel recall and selection. The system offers remote control with up to 15 pay tiers. The input bandwidth of 54 to 504 MHz provides a channel capacity of up to 63 channels.

For more information contact Winegard CATV Division, P.O. Box 329, Montgomeryville, Pennsylvania 18936, (215) 822-6731 or (800) 523-2529.



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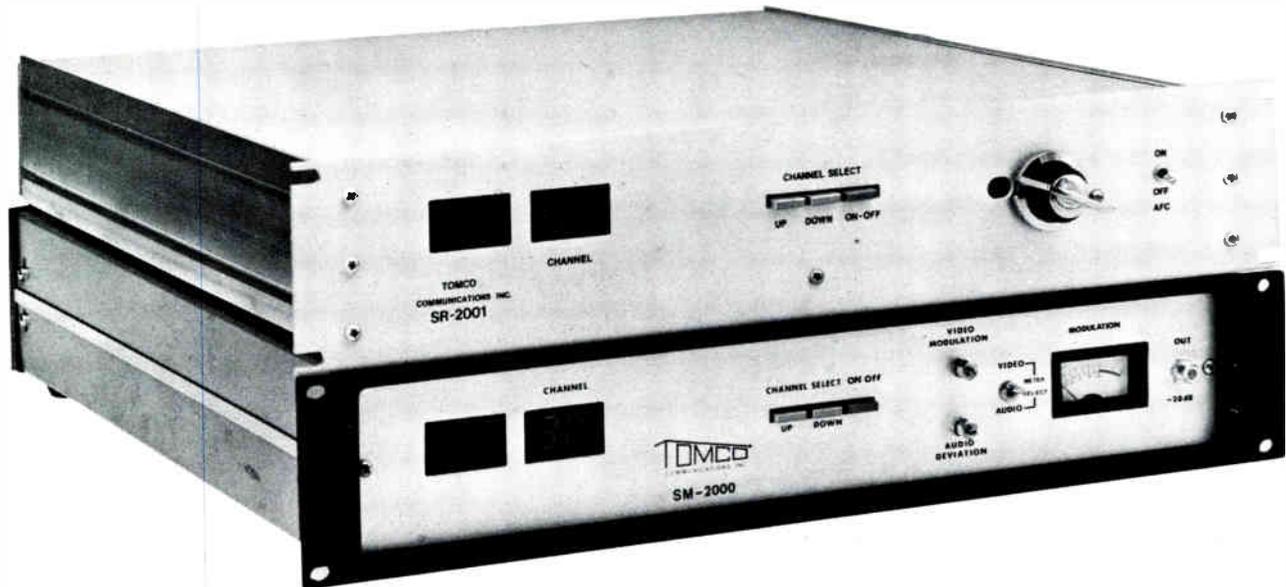
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### FEATURES:

#### SR-2001

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#### SM-2000

- ★ Crystal controlled 38 channel tuning
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# TOMCO COMMUNICATIONS

DIVISION OF UNITED SCIENTIFIC CORPORATION

A DATA-DESIGN COMPANY

4800 Patrick Henry Drive, Santa Clara, CA 95054 (408) 988-7722

**Cable**

**Scientific-Atlanta**

Scientific-Atlanta has introduced a new bendable coaxial cable which is designed to be pulled through conduit and to be shaped around bends easily without causing distortion. According to the company, the superior handling and abrasion resistance of the product saves installation time.

CableFlex can be used for broadband data applications, urban systems and two-way CATV systems. It is a 440 MHz, 75 ohm cable with an attenuation factor equal to GID3 cables. The cable can be used to build an entire system or can be used in conjunction with a GID3 trunk system. A standard connector is available to join the two types of coax.

For additional information contact, Robert Kuntz, marketing manager, 602/268-8744.

**Construction Equipment**

**Ben Hughes Communications Products**

Ben Hughes featured a new conductor cleaner from Cable Prep. The model 4010 removes bonded dielectric from the center conductor and can be used on all foam dielectric cables, except those chemicals requiring heat or chemicals.



Ditch Witch 350SX lawn plow

**Ditch Witch**

Ditch Witch displayed its newest cable product, the 350SX lawn plow at the NCTA convention. The 350SX is a 35-horsepower unit designed for cable burial. The machine installs cable without trenching by feeding the cable through a vibrator and planting it directly into a small slit made in the ground. Plant can be installed at depths of 12 and 24 inches and the nature of the burial allows for more complete lawn restoration.

For more information contact Ditch Witch, P.O. Box 66, Perry, Oklahoma 73077, (405) 336-4402.

**Gilbert Engineering**

A hex crimp tool, the G-CRT-804, was introduced at the NCTA convention by

Gilbert Engineering of Phoenix, Arizona. The tool features a ratchet design for reliable, positive crimping, and the tool jaws will not open until the crimp is completed. Ratchet adjustments permit accurate tool calibration. The tool jaws are manufactured of tool steel, not power metal.

Hex jaw dimensions are .262, .324 and .384 (flat to flat). The tool can be opened before the full cycle is reached by use of the ratchet release feature.

For more information contact Gilbert Engineering, P.O. Box 23189, Phoenix,

Arizona 85063. Phone (800) 528-5567 or (602) 245-1050.

**Magnavox CATV Systems**

Magnavox has added to their full line of 500 MHz cable connectors. The MX connector series is now available in .412", 1/2", 5/8", 3/4", 7/8", 1", metric sizes, and a complete line of brass "F" type connectors. The MX-connectors are offered in feed-thru, pin, and splice constructions.

For more information contact Magnavox CATV Systems, 100 Fairgrounds Dr.,

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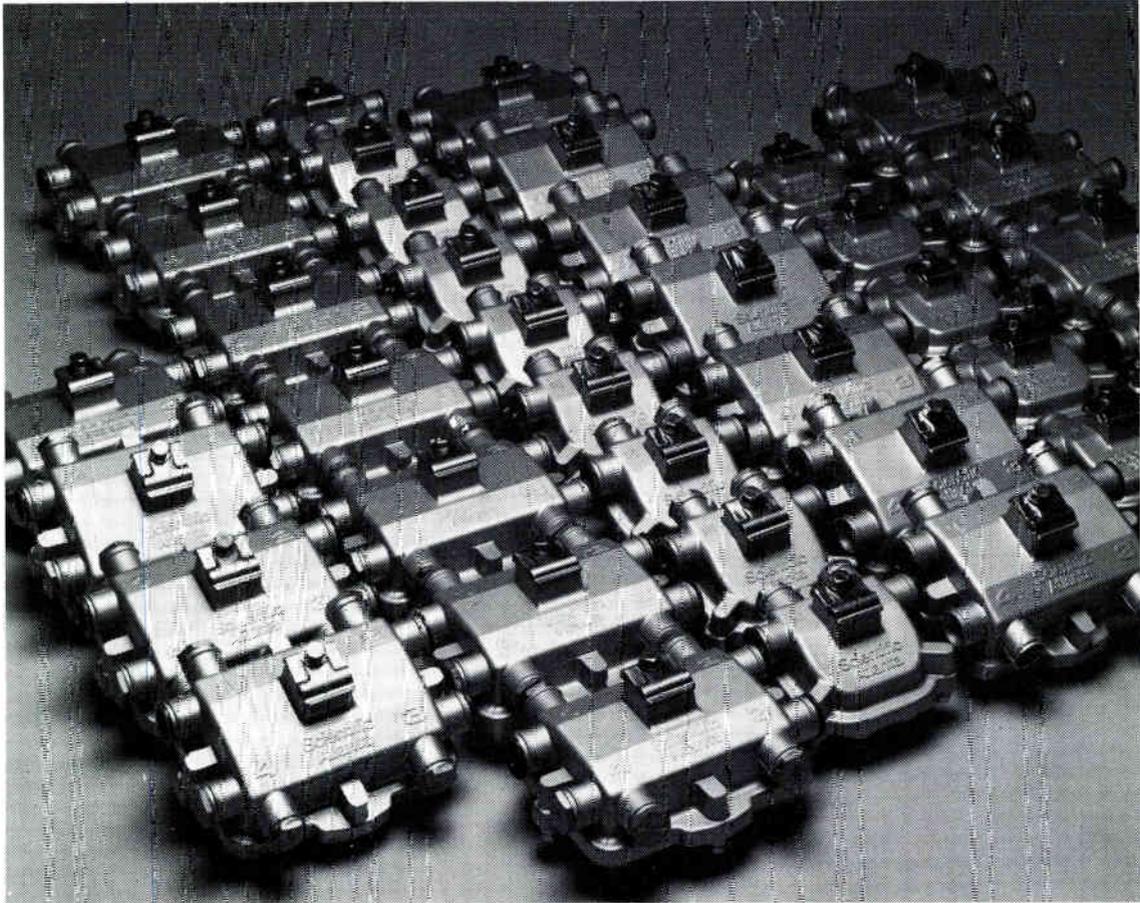
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**Scientific  
Atlanta  
Communications**

Box 105027, Dept. A-R, Atlanta, Georgia 30348

Manlius, New York 13104, (315) 682-9105.

### Ripley/Cablematic

The Ripley Company Inc. has introduced two new products to their Cablematic tool line. The first is a new sheath stripping blade for the model "SST" sheath stripping tool. Designed to provide a precision cut without moving parts, the blade will eliminate the occasional cleaning required in the past.

The second product is a strip stop, available for the model "CST" combination stripping tool to provide fixed strip lengths. These stops are easily inserted and will ensure a proper strip length. The stops come in single lengths to suit the application and connector to be used.

Ripley featured the CST coring/stripping tool and the CR596B crimp tool at the NCTA convention. The CST coring/stripping tool performs two functions in one operation. It has been designed to work manually or with a 3/8" power handle.

The CST-R (with ratchet) and the CST-P (for power operation) are available in all six sizes from .412 through 1.000 and are designed for all polyethylene coaxial cable.

The CR596B is designed for crimp-type connectors used in conjunction with RG-59/U and RG-6/U cables used for house drops. Ratchets have been eliminated by the use of a star wheel compression adjustment that gives a positive crimp every time.

For more information contact the Ripley Company, (203) 635-2200.

### Tyton Corporation

Tyton Corporation displayed aerial support spacer ties designed to save the aerial mounting crew handling time in installing cable on the overhead strand. Molded of a high density black polypropylene plastic, Tyton aerial support spacer ties resist sunlight and harsh chemical corrosion.

The polypropylene plastic construction eliminates the hazard of working with sharp metal edges as is common with metal support ties. The Tyton aerial support spacer ties are convenient to use and are cost-competitive with standard metal ties.

For more information contact the Tyton Corporation, P.O. Box 23055, 7930 North Faulkner Road, Milwaukee, Wisconsin 53223, (414) 355-1130.

## Distribution Amplifiers

### Broadband Engineering

Broadband Engineering, a subsidiary of Augat, introduced a line of five one-way and bi-directional multiple dwelling and

house-drop amplifiers at the NCTA annual convention.

The most flexible of the Broadband multiple dwelling amplifier offerings is the Super Multiple Dwelling Amplifier (SMDA). The SMDA may be purchased in a one-way configuration and be upgraded with a return amplifier to make it a fully capable two-way amplifier. The SMDA also features a variety of gains up to 40 dB and 300 and 440 MHz bandwidths. An optional plug-in equalizer is available for extended equalization. Controls include gain and slope as well as plug-in input and

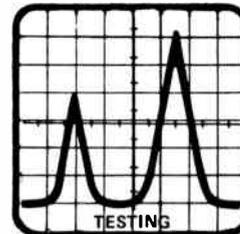
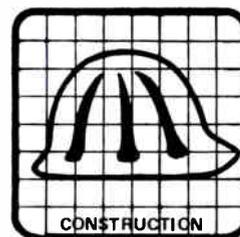
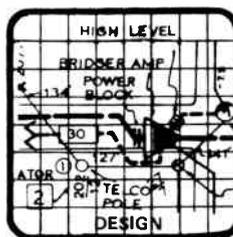
return line pads.

The Multiple Dwelling Amplifier (MDA) is a one-way amplifier designed for those situations where a maximum of 30 dB is required. It features push-pull hybrid circuitry, a plug-in pad for gain control, a variable slope control and optional plug-in equalizer. It is powered by UL approved Class II transformer that may be located remotely for the amplifier.

Broadband's two-way Signal Stretchers (SS) are designed to provide additional gain for long house drops and multiple TV outlets as well as for small

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**RCA** Cablevision Systems

## Custom Headend The "Best"

St. Marys, GA. - Don Trednick, Owner/Operator of the Kings Bay Cable Television System knows the value of an RCA pre-tested, custom headend. "Our custom headend gives us a great amount of peace of mind. We followed the assembly drawings and, when the headend was turned on, it was virtually perfect with respect to levels. It's the best system an operator can purchase."

"Other suppliers had sold us gear without proper testing," adds Trednick. "We even experienced failure rates as high as 75% with some of the non-RCA equipment. With RCA, we received excellent service."

The residents of the St. Marys area and of the new Navy base under construction nearby enjoy the benefits of the 20-channel system. As residential expansion continues, Don Trednick's Kings Bay Cable Television System will be on with its RCA custom headend reliably meeting the programming requirements.

## Mid-Split Extender Allows Cost Reductions

RCA Cablevision Systems realizes the cable operators' need to acquire new economies in mid-split systems applications. The new Model 270 (330 MHz systems) Mid-Split Line Extender is designed to meet that need and deliver those economies.

Prior to these RCA products, when mid-split system operators wanted to distribute a signal to a new area, they had to be near the trunk line. Another alternative was to run a new trunk line to the distribution area. The results were that a mid-split system would have many costly trunk amplifiers.

The RCA Model 270 line extender now allows efficient coverage of larger distribution areas with the less expensive amplifiers. Depending on system size, the cost savings could be substantial.



New RCA Model 270 Mid-Split Line Extender.

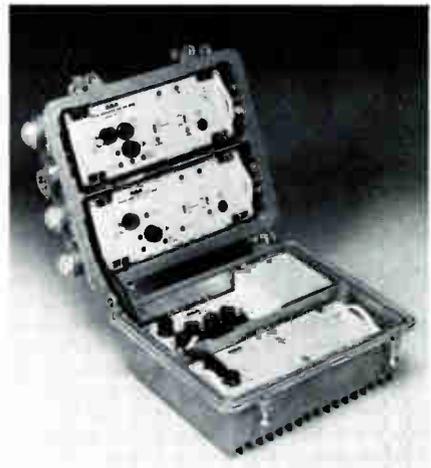
For complete technical information on the RCA Model 270 mid-split line extender, contact your RCA representative or write to CABLE TODAY, RCA Cablevision Systems, 8500 Balboa Blvd., Van Nuys, CA 91409.

## Programmed AGC Controls Upstream Signal

State-of-the-art CATV amplifiers, such as the RCA Model 272 Mid-band Split unit, provide good control over downstream system levels with AGC. In a bi-directional system, however, temperature related cable attenuation is not as easily handled with AGC.

Although methods like thermal control may prove satisfactory in some instances, they do have shortcomings. An alternative, recommended by RCA Cablevision Systems as one of the most advantageous means of controlling the upstream signal is, *Programmed Upstream AGC*.

A pilot signal sent down the cable provides a reference signal to the AGC of the downstream amplifier. The control voltage resulting from the pilot signal will be sampled in the AGC module and fed to the programmer, which programs the control voltage to provide a proportional change in the upstream amplifier gain. Because they share a common cable,



the upstream cable change over the temperature range will be directly proportional to the downstream change.

Contact your RCA sales representative for a complete description of this procedure. Or write to RCA Cablevision Systems, CABLE TODAY, 8500 Balboa Blvd., Van Nuys, CA 91409, requesting Cablevision News, Volume 2.

apartment and motel distribution systems. They feature full channel loading for the design bandwidth and diplex filters for two-way systems. The units are powered by UL approved Class II transformers that may be remotely located. One-way Signal Stretchers are available without return capability.

For more information contact Broad-band Engineering Inc., P.O. Box 1247, Jupiter, Florida 33458, (305) 747-5000 or (800) 327-6690.

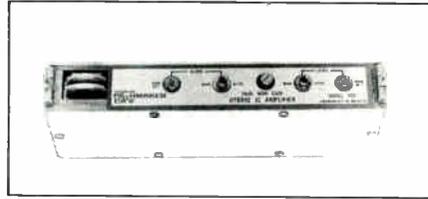
**Century III Electronics**

**Century III Electronics International Inc.** featured its 4100 series feed-forward trunk amplifier at the NCTA annual convention. The 4100 series is designed for use in total cable systems, long-haul super-trunk systems.

The 4100 series uses pairs of high-quality integrated circuits in a feedforward configuration. A plug-in motherboard accommodates combinations of trunk bridger and intermediate or terminal functions in both the MGC and AGC modes. Operating gain options of 22, 26, or 30 dB are available in both trunk and bridger modules, providing flexibility in system design. Signal levels are maintained by automatic gain and slope control (AGC/ASC) circuits which re-

spond to either dual modulated or unmodulated pilot carriers, or video carriers.

For more information contact Century III Electronics, 610 Neptune Ave., Brea, California 92621, (714) 630-3714.



*Sylvania Pathmaker model 163*

**GTE Products Corporation**

**GTE Products Corporation** announced a new station module that will allow present 12-channel systems having Sylvania equipment to increase channel capacity up to 35 channels without resplicing cable or respacing amplifiers, and without significantly degrading system specifications.

Because the Sylvania products have modularized functions, the new model 163 can easily be plugged into any of the existing Sylvania amplifier stations including the first stations manufactured more than ten years ago. The 163 module can operate in either an automatic or manual mode.

With this module having a 2 dB increase in dynamic range over most lower gain trunk amplifiers, a system operator can increase channel capacity inexpensively and increase revenue.

**GTE's Sylvania CATV Division**

**GTE's Sylvania CATV Division** introduced a new sub-VHF bridger switch option for the existing series 2000 trunk/bridger station.

The sub-VHF bridger switch receiver and controller allows systems to receive return video or data transmission from the distribution on a time assignment basis. The system will shut off unused return lines, thus reducing noise build-up. The system will also facilitate troubleshooting of ingress by selectively switching off return lines until the area of interference is isolated.

Upgrade to existing stations can be accomplished simply by securing the sub-VHF bridger switch to the 2000 station housing with two of the station's existing mounting screws and with plug-in connections. No soldering or unsoldering is required.

For additional information, contact Sylvania CATV, 10841 Pellicano Drive, El Paso, Texas 79935, (915) 594-3555.

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## Magnavox CATV Systems

**Magnavox CATV Systems** offered 440 MHz systems complete with system design, hardware, training, field engineering and customer service at the NCTA Convention.

Headlining the field-proven Magnavox 440 MHz hardware is the Magna 440 mainstation amplifier. With a 50-440 MHz bandwidth, the Magna 440 is capable of expanding cable system potential. According to the company it exceeds present equipment requirements and has the built-in capacity to handle future commitments.

Features of the Magna 440 include compatible 440 MHz trunkline, bridging and distribution modules, universal module chassis, multi-tier surge protection, plug-in status monitoring, plug-in return trunk and feeder disconnect, lightweight 5THBE housing and built-in input and output AC test point.

For more information contact Magnavox CATV Systems, 100 Fairgrounds Drive, Manlius, N.Y. 13104.

## TRW Semiconductors

The first national presentation of two new series of CATV hybrid amplifiers was made by **TRW Semiconductors** at the National Cable Television Association convention.

TRW Semiconductors presented the CA 5000 Series "super chip" hybrid amplifiers with 3 dB lower distortion and 2 dB lower noise figure than competitive devices. The CA 5000 offers the highest performance in the field over the 40 to 450 MHz frequency range. Three versions are available: CA 5101 and 5201, both with 18 dB of gain and CA 5600 with 34 dB of gain.

The CA 4400 Series of hybrid return amplifiers in the 5 to 200 MHz frequency range were also presented. Designed for higher-frequency mid-split systems, these amplifiers offer high dynamic range to eliminate critical fine tuning problems. Three models are available: CA 4412 with 13 dB of gain, CA 4418 with 18.5 dB and CA 4422 with 22 dB of gain.

For more information contact TRW Semiconductors, 14520 Aviation Blvd., Lawndale, California 90200, (213) 679-4561.

## Earth Stations

### Andrew Corporation

The new 4.5-meter and 5-meter ESA5 earth station antennas from **Andrew Corporation** comply with the FCC's pattern proposal for 2° satellite spacing. ESA5-series antennas are available in single or dual polarized versions for operation in the C- and Ku-Bands. Their modular design permits an installation

tailored to specific customer needs. The aluminum reflector is segmented for ease of handling and lower shipping costs. Foundation requirements are non-critical, demanding only  $\pm 15$  degree alignment accuracy. These new earth station antennas can provide significant savings by eliminating the need for antenna modifications or replacement to comply with future regulations.

For more information contact, Andrew Corporation, 10500 West 153rd St., Orland Park, Illinois 60462, (312) 349-3300.



Andrew 4.5-meter earth station

## Harris Corporation

**Harris Satellite Communications Division** introduced their new Delta Gain Earth Station System at the NCTA convention. The system includes a deep dish three-meter antenna, a new model 6528 video receiver and a low noise amplifier.

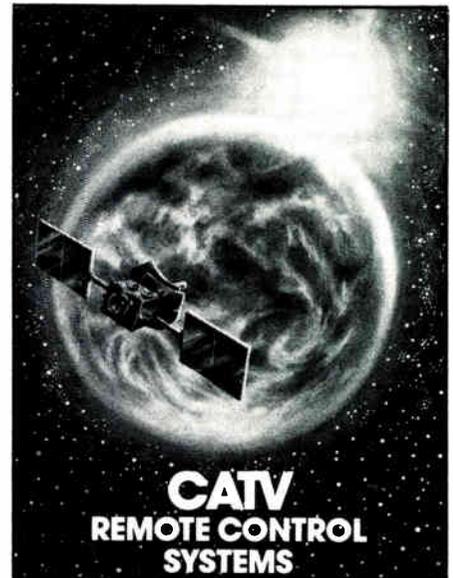
According to the company, innovations in the engineering concepts of antenna theory have provided the 3-meter Delta Gain with at least 20% more efficiency than prime focus systems. The deep dish surrounds a unique subreflector monopod feed assembly. The Delta Gain simultaneously combines high gain (78% antenna efficiency), reduces terrestrial and sidelobe interference and reduces antenna noise temperature. With the appropriate LNA, the Delta Gain achieves performance nearly equal to 4.5-meter prime focus antenna systems.

For more information contact the Harris Corporation, (305) 724-3445.

## Enclosures

### Channel

**Channel Commercial Corporation** introduced a pair of underground tap housings (UTH) at the NCTA convention.



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MONROE ELECTRONICS, INC.

216 Housel Avenue  
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SAM Jr. doesn't ask you to compromise reliability and construction, either. The drawn aluminum case is tightly sealed

and has a lexan-clad backprinted panel. Everything about SAM Jr. is built to take all the banging about a signal level meter has to expect. And it weighs less than 6 pounds.

SAM Jr. is available in a VHF version that covers 10 to 300 MHz in five bands of all-electronic tuning. (No adapters or compensators are needed). A 450 MHz range extension is optionally available. If you need to go even higher, we have a UHF version that covers the 470 to 890 MHz spectrum.

Another thing to remember: SAM's price includes rechargeable batteries and charger—usually offered as options on other meters.

Sure, you can pay a few dollars less for a signal level meter. And pay, and pay, and pay.

For details, contact Wavetek Indiana, Inc., 5808 Churchman, P.O. Box 190, Beech Grove, IN 46107. Phone Toll Free 800-428-4424. In Indiana (317) 787-3332. TWX 810-341-3226.

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## SAM Jr. The meter by which low prices should be measured.



Designed for systems having most of their construction work below ground, the housings are made of ABS plastic, incorporating material from neoprene sealing grommets and gaskets. According to Channel officials, the units can be opened and closed repeatedly without the use of an airtight seal around taps.

The video frequency response of the CDM 1155 is  $\pm 1$  dB, 39 Hz to 4.2 MHz. The input level for 87.5 percent depth of modulation is 0.75 V peak-to-peak with the differential gain at  $\pm 0.5$  dB and phase at  $\pm 3^\circ$ . The audio frequency response is  $+1$  dB, 50 KHz to 15 KHz.

For more information contact Comtech Data, (602) 968-2433

one 6 MHz TV channel. The model 450 G is a 19" rackmount chassis that utilizes 12 voice channels organized as a group similar to an A-type channel bank.

The model is designed to exceed Bell specification 3002 for voice transmission.

The Phasecom model 425 Intelligent Cable Network modem offers a flexible way to interconnect data processing, terminal and communications equipment over an existing or new CATV signal distribution system. Model 425 offers four full duplex data ports and has full diagnostic capability built in.

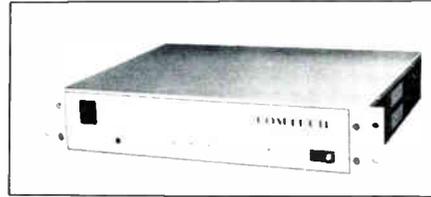
For more information contact Phasecom, (213) 641-3501

## Headend Components

### Comtech Data

**Comtech Data Corporation** announced the introduction of a new agile cable modulator, the CDM 1155. A low cost alternative for CATV headend operation, it can be used either as a primary or backup channel modulator. The unit features a front panel digital switch for selection of standard channels from 55.25 MHz to 439.25 MHz. Expansion is possible for additional channels. Optional programming of the channel select switches is available to meet customer requirements.

Stability and performance of the CDM 1155 are achieved through the use of a SAW filter and crystal controlled phase locked channel synthesizer locked to a 45.75 MHz crystal reference. An IF loopthrough is optional.



Comtech Data 1155 modulator

### Phasecom Corporation

**Phasecom Corporation** featured seven new products at the NCTA convention. The model 450 voice modem is a transceiver for full duplex operation over two-way broadband coaxial cable networks. It is used for a variety of applications such as dedicated telephone links, paging systems, telemetry and other applications that formerly were restricted to twisted pairs. Up to 240 simplex voice channels can be accommodated within

### RCA Cablevision Systems

**RCA Cablevision Systems** has introduced a new solid state color television modulator for cable TV headend applications.

Designated the CTM20, the new modulator was shown at the National Cable Television Association convention.

The new microprocessor-controlled CTM20 modulator features the capability for both local monitoring and for remote monitoring from a centralized control station, allowing all the modulators in an entire cable system to be controlled from a single location.

# THE STANDARDS OF THE INDUSTRY

## Hiatt Cable Clips for Coaxial Cable Installation.

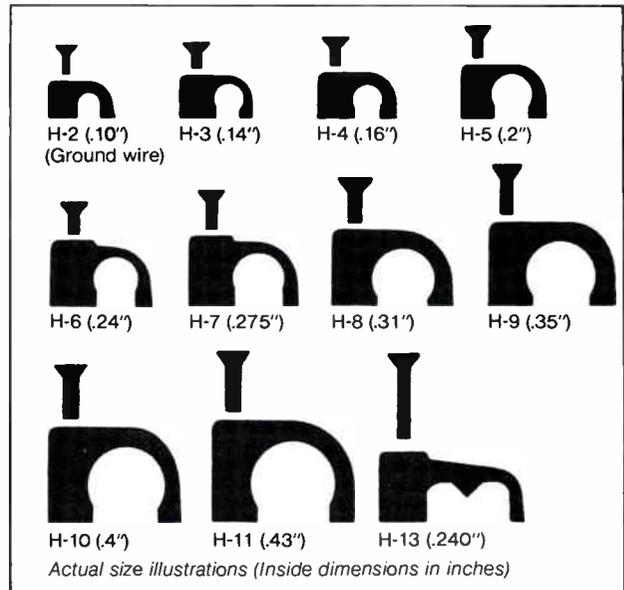
Hiatt cable clips were specifically designed for coaxial cable installation. And we've a full line of them for every coax cable size!

The contour design permits the clip to "push-fit" onto the cable for quick, simple installation. It also protects the cable from being pinched or crushed, which could damage shielding and distort the signal.

The heavy duty, flat head nail is fixed in the polystyrene clip and will not fall out during shipping or installation. It's cadmium plated, hardened cold rolled steel that will drive into wood, plaster, brick, mortar or concrete block.

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The CTM20 also provides solid state switching functions including automatic switching to alternate video sources in case of loss of signal from the primary source and programmable switching to a selected video source at a predetermined time.

The new RCA modulator is capable of handling up to four sources including three video/audio inputs and one emergency alert audio input. The optional inputs are provided as chassis plug-in assemblies.

For more information contact Wade Hansen, RCA Cablevision Systems, 8500 Balboa Blvd., Van Nuys, California 91409, (213) 891-7911.

## Home Security

### ADT Security Systems

**American District Telegraph Company** (ADT), a 107-year old security and alarm company displayed its wares and central station monitoring capabilities for the first time at this year's NCTA convention.

ADT offers cable operators a turnkey security operation. ADT can market to subscribers, install residential systems, service them and provide central station monitoring. Through ADT, a CATV system operator may even offer mobile security guard service.

For more information contact ADT, 1 World Trade Center, New York, New York 10048, (212) 558-1100.

### CableBus/Colorado Electro-Optics

**CableBus Systems Corporation** and **Colorado Electro-Optics** have jointly produced a wireless sensor system with a cable alarm reporting system for security applications. According to a news release from CableBus, the combined system incorporates the best features of wireless and cable and solves the high cost of installation. The system was introduced at the NCTA convention.

The CableBus/Colorado Electro-Optics P-65/ACT-1 is a multi-mode, multi-channel central control system that receives digitally coded security information from remote wireless transmitters and processes that information to provide the required outputs. These outputs can provide visual and audible annunciation, dialer and siren activation and can be relayed to the cable alarm monitoring center as appropriate to the installation. LED indicators on the P-65/ACT-1 front panel display system status and provide alarm memory indications.

CableBus also featured their new MICRO-1.5 central alarm system at the NCTA convention. This system can

accommodate 4000 to 8000 subscribers in the initial suggested configuration.

Built around the DEC PDP 11/03 Computer, the MICRO-1.5 system includes triply redundant backup storage capability (two discs plus core memory) and can operate efficiently as a satellite (unattended) machine.

For more information contact CableBus, 7869 S.W. Nimbus Ave., Beaverton, Oregon 97005, (503) 643-3329.



S-A series 2400 security system

### Scientific-Atlanta

**Scientific-Atlanta Inc.** has introduced a security products package which, according to the company, will help the cable operator make a smooth and confident move to interactive services. The new series 2400 cable security monitoring system features a complete line of headend and computer monitoring equipment with a comprehensive software package.

The monitoring system is compatible with many different alarm systems. It can serve multiple headends or headends with multiple hubs. The computer can handle from 2,000 to 64,000 subscribers. A digital dialer for system redundancy can be fully integrated with the computer so alarm reporting and monitoring proceed as usual if the cable system should fail.

Scientific-Atlanta will deliver Series 2400 systems in 120 days ARO. Product support services, applications engineering and technical literature are also available.

For more information contact Scientific-Atlanta Inc., One Technology Parkway, Box 105600, Atlanta, Georgia 30348; Telephone (404) 441-4000.

## Pay TV Devices

### Intercept Corporation

**Intercept Corporation** has two new products—a pay TV tier trap and a parental control trap. The pay TV tier trap

is available in four specifications: TTL (lowband 2-6), TTM (midband A-1), TTH (highband 7-13) and TTS (superband J-W). The new series of pay TV traps have durable and corrosion resistant nickel-plated brass construction, are completely encapsulated to inhibit moisture absorption and also have threaded sections machined from solid brass. They feature weather tight "O" ring sealing on the outer sleeves and a PCV boot sealing against the port to prevent degradation to the connection.

Intercept's new PTV 300 3-channel parental control trap is also available in low, mid, high and superband specifications. This video-only trap features complete RFI shielding, requires no additional jumpers or splices to install, and includes a 5-disc tumble key lock with two keys. The PTV 300 parental control trap is the only multi-channel key-lock trap utilizing printed circuit board construction in a rugged miniature enclosure.

For more information contact the Intercept Corporation, (201) 471-2212.

### Jerrold

The new **Jerrold STARVUE** add-on module was unveiled at the NCTA show, promising expanded opportunities for impulse pay-per-view with addressable cable systems.

Designed for use with the new STARCOM 450 converters, the STARVUE unit will allow last-minute selections for pay-per-view events through the remote control handset of the digital converter.

Starvue uses the 106.5 MHz downstream channel and a single upstream channel between 8.6 MHz and 10.1 MHz. An alternate upstream channel in the same range can be selected if the original channel becomes unreadable. Unique coded entry authorizations are designed to eliminate accidental keying for unwanted pay-per-view events. An event-charge LED on the unit indicates reception of pay-per-view programming.

For more information contact Jerrold, (215) 674-4800.

## Power Supplies

### Alpha Technologies

**Alpha Technologies** has introduced a model UPS 1000 computer grade standby power supply which features a quick switchover time. The switchover speed warrants the computer grade nametag. In addition, the Alpha model will offer sine-or squarewave output, a high efficiency design and is adaptable for data processing equipment.

For more information contact Alpha Technologies, 1305 Fraser Street, D-6,



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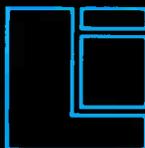
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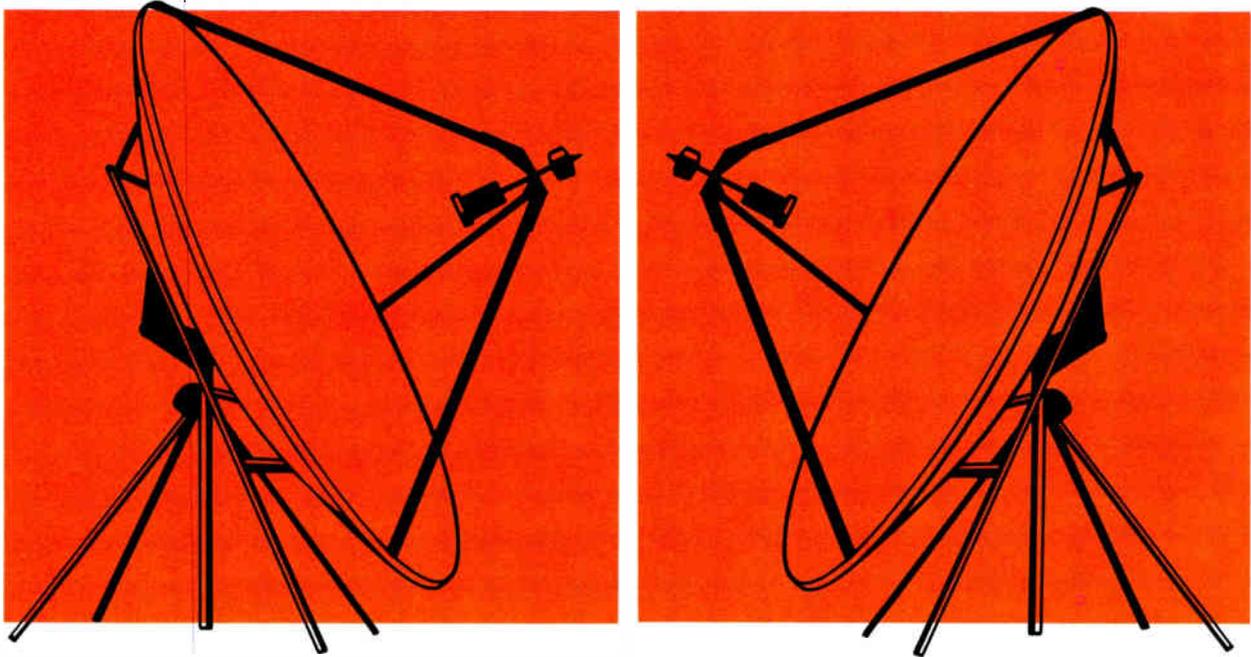
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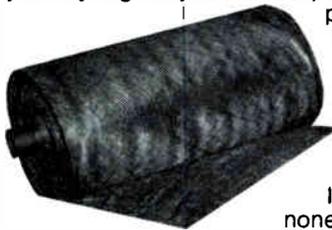
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Bellingham, Washington 98226. Telephone (206) 671-7703.

## Satellite Receivers and Components



Automation Techniques GLR 550 satellite receiver

**Automation Techniques** introduced additions to its receiver line at the NCTA convention. The "dish stretcher" can be added to a satellite earth station to improve signal reception, reduce noise interference and eliminate "sparklies" created by the use of a dish that is too small.

"Sparklies" are identified by the dish stretcher and erased from the picture signal after entering the receiver.

Automation Techniques has also introduced a new GLR 550 satellite receiver to replace its older GLR 500 model.

The GLR-550 features ATI's imageless mixer design which effectively eliminates image frequency noise and interference. Two tuneable audio channels for direct or matrix stereo are standard as well as a 12 push-button selection of transponders with fine tuning control and level meter indicators.

For single receiver installations, the GLR-550 has a separate weatherized remote tuning module. Its 70 MHz output can be run through standard coax instead

of expensive microwave cables.

For more information contact Automation Techniques, 1846 N. 106th E. Ave., Tulsa, Oklahoma 74116, (918) 836-2584.

### Avantek Inc.

**Avantek Inc.** has introduced three new options for its six-simultaneous-channel AR1000 Simulchannel™ earth station video receiver. Block downconverters mounted at the receiver permit operation without antenna-mounted downconverters; a feedline diplexer permits 3.7-4.2 GHz RF, and 940-1440 MHz IF signals to be transmitted on the same feedline, and a memory backup system maintains channel tuning commands for up to 24 hours during power failures.

The ADC-4220 downconverter plugs into one of the AR1000 receiver's six IF demodulator slots (two units are required for simultaneous horizontal and vertical reception) permitting the receiver to operate directly from 3.7-4.2 GHz downlink signals rather than with the usual antenna-mounted LNA/block downconverters.

Also primarily intended for retrofitting existing earth stations, the ADA-4200 RF/IF diplexer combines 3.7-4.2 GHz signals with the 940-1440 MHz IF band for transmission down a single feedline. If one polarization is downconverted with an antenna-mounted LNC and the other is simply amplified in a conventional LNA, both may be carried on the same feedline to the receiver, then separated using a second ADA-4200 diplexer. An ADC-Series downconverter at the receiver is then used to translate the 3.7-4.2 GHz signals to the 940-1440 MHz IF band for processing in the receiver.

For more information contact Avantek, (408) 727-0700.

### Microdyne Corporation

**Microdyne Corporation** featured its new 1100 CSR satellite receiver at the NCTA convention. The 1100 CSR is a compact 1 3/4" rack-mountable unit that is 24-channel frequency synthesized. It includes automatic polarity selection in both 12- or 24-channel modes of operation. The CSR's channel readout shows either 12-channel or 24-channel indication and the proper polarity to accommodate the transponder selected.

CSR features include patented FM demodulation, remote control capability with BCD input and FM demod output for use with external subcarrier equipment. It also provides dual video outputs, 70 MHz output and LED strength indicator.

For more information contact Microdyne Corporation, P.O. Box 7213, Ocala, Florida 32672, (904) 687-4633.



Newton Electronics GBS 2500

### Newton Electronics Inc.

**Newton Electronics Inc.** has developed a model DC 400 dual-conversion downconverter, intended for C-band-to-70 MHz down conversion at the antenna. Downconversion at the antenna provides operators with the advantages of LNC technology. This configuration allows the use of lower cost cable runs from the antenna to the signal processing equipment.

Complete with input, interstage and output filtering, the DC 400 accepts its +24 VDC operating power through a separate power line and 0 to +24 VDC tuning voltage on the center conductor of

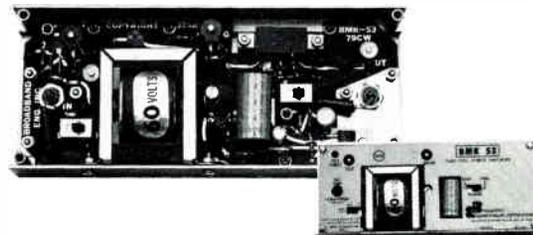
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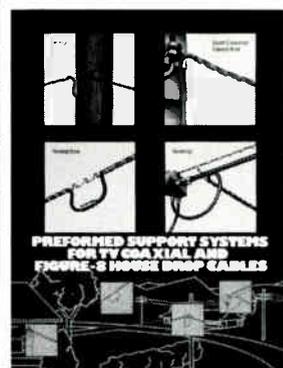
GDE-1104L	Galvanized Guy-Grip Dead-End for 1/4" Galvanized Steel Strand
GLS-2104	Galvanized Strand Splice for 1/4" Galvanized Steel Strand
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#### For House Drop Coaxial Cables specify:

DE-1500	Galvanized Telegrip for RG-59/U Coaxial Cable
DE-3329	Stainless Steel Custom Dead-End for RG-59/U Coaxial Cable
DE-2525	Galvanized Dead-End for .051 Galv. messenger of Figure 8 RG-59/U Coaxial Cable
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#### For protection of Strand and Cables, specify:

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# PREFORMED LINE PRODUCTS

the 70 MHz cable from the IF receiver. LNA power is supplied internally and provided to the LNA either through a separate power line or on the center conductor of the C-band cable. The DC 400 provides a separate signal strength meter output and is fully weatherproofed and RF shielded.

For more information contact John Stover, Newton Electronics, (415) 967-1473.

## Set Top Converters

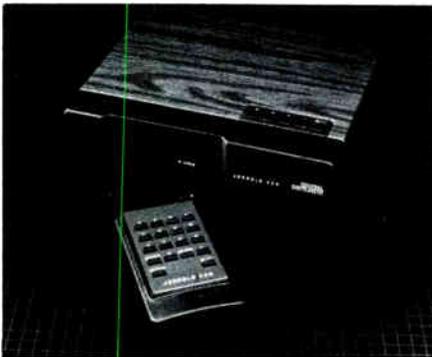
### Jerrold

The Jerrold Division of **General Instrument Corporation** announced at the convention a new 450 MHz digital converter that expands cable TV service to 66 channels.

Based on the technology of the Jerrold STARCOM IV 58-channel converter, the new STARCOM 450 comes in standard, multilevel descrambler and addressable multilevel descrambler models. Adding an optional A-B switch increases the microprocessor-controlled unit to a capacity of 132 channels of cable service.

The STARCOM 450, which, according to the company, will be produced in set-top and cordless remote control models, includes automatic fine tuning, improved mechanical security and an optional parental control key lock. The descrambler model has a potted descrambling digital board while the addressable model includes a potted addressable board for sensitive circuitry. Also, the addressable unit is upgradable to impulse pay-per-view.

For more information contact Jerrold Division, General Instrument Corporation, 2200 Byberry Road, Hatboro, Pennsylvania 19040, (215) 674-4800.

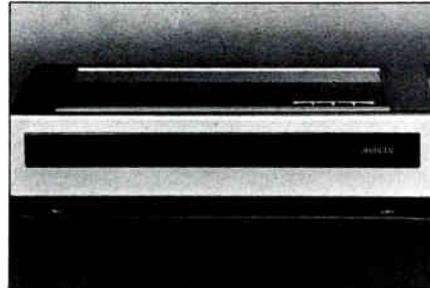


Jerrold STARCOM 450

### Kanematsu-Gosho

**Kanematsu-Gosho** introduced the SPRUCER base band converter at the NCTA convention. This micro-computerized addressable converter is unique in

that it has one-way addressability, upgradable to a two-way system. It also features a three digit LED channel display, remote termination ability in the headend, 128 tags for all-channel pay-per-view service, dual input (A/B cable), automatic selection for up to a maximum of 128 channels and a 444 MHz, 64 channel phase-locked synthesized conversion for Standard, HRC and IRC channel frequency.



Kanematsu-Gosho SPRUCER

### Magnavox

**Magnavox CATV Systems** has introduced an upgradable converter, a digital system sentry status monitoring system and a new line of 500 MHz MX connectors.

The 6400 upgradable converter has 64 channels, a lock top tamper proof lid that secures the unit without screws, a favorite channel memory, parental discretion code, programmable forced tuning to directory channel and programmable high channel limit.

The digital system sentry uses a centralized computer base to monitor each trunk amplifier within a system. Other features include recreation in return noise funneling, shortened customer complaints, decreased repair costs, status reports on DC power supply, forward level and return level reports, return feeder and return trunk switching, audio fault alarm and upgradability.

Magnavox CATV's 500 MHz connectors are now available in .412 inch, 1/2 inch, 5/8 inch, 3/4 inch, 7/8 inch and one inch, metric sizes and a complete line of brass "F" tube connectors.

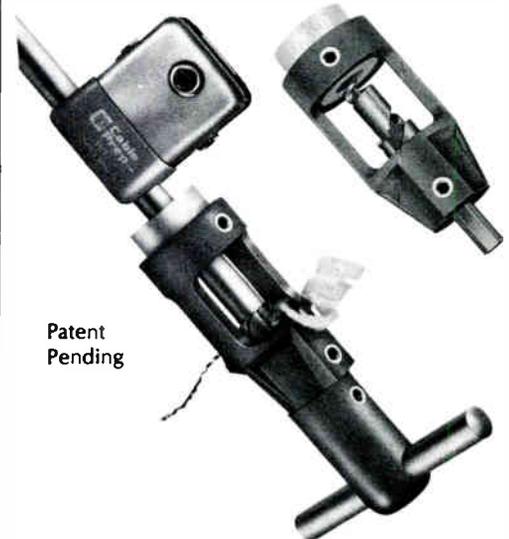
For more information contact Magnavox, 100 Fairgrounds Dr., Manlius, New York 13104, (315) 682-9105.



Magnavox 6400 converter

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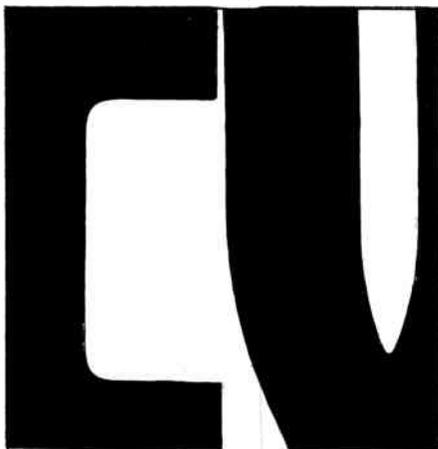
## NEW PRODUCT

### Inductive Amplifier Identifies Wires in a Group



The 200A inductive amplifier is designed to identify and trace wires or cables within a group without damaging the insulation. The probe weighs 2 oz. and has a leather case. A tone from the probe's internal speaker indicates which wire is attached to the tone generating test set. A hand set can be clipped to the ears on either side of the probe if desired.

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## CABLE'82

### ROMAN Series

**Octagon-Scientific Inc.** and **Regency Electronics Inc.** introduced the ROMAN programmable converter series. The RO/CP-3R, 450 MHz programmable converter with wireless remote control was featured at the convention. Utilizing microprocessors and field upgradable to addressability, the ROMAN series offers silent fast up and down scanning, as well as standard channel selection with favorite channel memory and last channel recall via remote control.

Options include parental control, channel agility, frequency offsets, A/B cable switch, SAW output filter, switched AC convenience outlet and either standard, HRC or IRC channel assignment selections. The addressable versions additionally offer two separate suppression modes of scrambling and 128 tiers are available in two modes of operation for a total of 256 different addressably-controlled tier combinations. A tamper-proof security design is built into each unit.

For more information contact Octagon-Scientific Inc., 476 E. Brighton Ave., Syracuse, New York 13210, (315) 476-0660.



RCA 58-channel converter

### RCA Cablevision Systems

**RCA Cablevision Systems** announced the expansion of its M Series of subscriber converters to include cord remote units at the NCTA convention.

The RCA M Series of converters are available in 58-channel models for 400 MHz cable systems and in 36-channel units for 300 MHz operation. The M Series converters use a single control direct address switching technique.

The RCA converter demonstrations featured a new 16-tag in-band decoder with a field programmable security plug designed to provide a pre-authorized tag level for decoding premium channels.

For more information contact Wade Hansen, RCA Cablevision Systems, 8500 Balboa Blvd., Van Nuys, California 91409, (213) 891-7911.

### Synchronous Communications

**Synchronous Communications'** frequency agile output converter was

featured at the NCTA convention. Synchronous is offering an output converter with 76-channel capacity.

The device accepts TV IF outputs from signal processors, modulators, etc., and can be used with or without remote control adaption. The frequency synthesized oscillator tunes the output of the FAOC-60 to standard VHF, mid-band, super-band and special CATV channels (54 MHz to 500 MHz). HRC and IRC channel assignments are also available.

The device can be used as the output converter of an AM modulator, allowing the output of satellite receivers, video tape recorders or other composite video signals to be modulated to any CATV channel frequency, thus providing a complete backup for important pay-TV channels.

### Zenith

Enhanced versions of **Zenith's** Z-TAC cable TV converter system were unveiled at the NCTA convention.

To expand the capabilities of the Z-TAC tiered addressable converter, Zenith has developed the Redi-Plug option. This feature, which can accommodate a wide variety of advanced applications such as two-way cable, text, security, home banking and shopping, brings new flexibility to Z-TAC, according to the company.

Another new Z-TAC option, the TAC-ALONG, makes it possible to upgrade older cable TV systems. TAC-ALONG allows cable TV operators to add addressability to a non-addressable system. The TAC-ALONG module can be connected between the existing converter and the television set. TAC-ALONG will be available in the Fall of 1982.

Z-TAC and TAC-ALONG both use two modes of video scrambling designed to provide improved program security. Horizontal sync pulses are suppressed to scramble the picture on a TV set not equipped with a decoder. The video is inverted to scramble the luminance and color.

For more information contact Zenith, (312) 391-8181.

## Test Equipment

### Biddle Instruments

**Biddle Instruments** featured the Megger direct reading ground tester at the NCTA convention. The tester features three-terminal operation for fall-of-potential earth resistance measurements or it can be used for two terminal tests to a ground reference. It has been designed for ease of use and reading.

After probes and connecting leads are

installed the selector switch allows an easy read of the ground under test. If a check of probe resistance and test lead continuity is desired, the selector switch allows the operator to use the probe resistance sub-scale. The direct reading 3/4" log-type scale provides good resolution over the entire 0.5 to 500 ohm range.

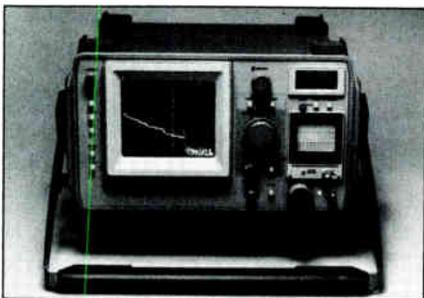
For more information contact Biddle Instruments, 510 Township Line Road, Blue Bell, Pennsylvania 19422, (215) 646-9200.

### Sadelco

Sadelco has announced the introduction of the Sadelette, a hand held signal level meter.

The Sadelette accurately indicates signal levels in one dB steps. This unit is not an inaccurate composite signal measuring device, it is an easy to read 1 dB resolution, 10 segment LED bar graph with a flashing over-range indicator. The total range of the Sadelette is -2 dBmV to +22 dBmV. The Sadelette features a channel 2 and 3 select switch on the standard unit for use with most CATV converters. This low cost unit is equipped with a low battery warning light and operates on 2-9V batteries.

For additional information contact Sadelco Inc., 75 West Forest Avenue, Englewood, New Jersey 07631, (201) 569-3323.



Tektronix fiber optic tester

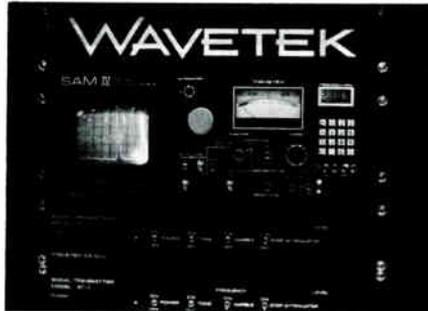
### Tektronix

**Tektronix Inc.** has introduced a fiber optic time domain reflectometer (FOTDR) that is capable of making quantitative, calibrated loss and distance measurements on multi-mode 125 um OD fibers with a core diameter of 50 um. The OF150 fiber optic tester has a chart recorder for documenting the presentation displayed on the CRT. There is also an LCD readout which provides the user with the capability of making calibrated, repeatable measurements. The OF150 costs \$17,500 and availability is about 14 weeks.

Tektronix also featured the 1503 cable tester, a tool that quickly pinpoints troublesome faults. It operates on the time domain reflectometry principle, which

provides a direct and easy to use method for locating and identifying faults in transmission cables. The 1503 is a long range (to 50,000 feet), moderate resolution (to 3 feet) unit that is optimized for checking long runs of cable. The unit costs \$4,625.

For more information contact Tektronix, (800) 547-1512, in Oregon, (800) 452-1877.



Wavetek SAM IV SLM

### Wavetek Indiana

**Wavetek Indiana Inc.** introduced several new products in its test equipment line at the NCTA convention. The model ME-1 memory expansion option for the model 1865 sweep receiver combines three separate functions into a replaceable plug-in option card, including an additional 8-memory storage capability, a specialized averager circuit and a unique digital normalizer.

The model SAM III D signal level meter now offers remotely controlled measurements. Using an RS-232 compatible interface, the unit can be used through a telephone or two-way cable. It can be pre-programmed for 120 channels, either video or audio, by keyboard entry.

The Model SAM IV rack mounted signal level meter can be pre-programmed for amplitude measurements with 120 channels by keyboard. The display scope features separate on/off function, brightness control and screwdriver adjustments for vertical and horizontal gain and position.

The SAM III, like the other models, can be pre-programmed for 120 channels and programmed for any frequency across the 4 to 450 MHz band in .1 MHz increments through the keyboard. UHF coverage of 470 to 890 MHz is available as an option. Wavetek also has a model SAM I, which covers the 50 to 450 MHz range.

In addition, Wavetek introduced the model SP549 remote controller for use with the model 1402A converter sweep, and a new line of tunable preselectors, covering the full 55 to 440 MHz band.

For more information contact Wavetek, 5808 Churchman, P.O. Box 190, Beech Grove, Indiana 46107, (317) 788-9351.

## TO-packaged Mixer and IF Gain Modules for TVRO... From Avantek



### UMX-4220 TVRO Mixer (TO-8 package):

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### UTO and GPD Series IF gain modules:

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Avantek's UMX-4220 and IF gain modules simplify TVRO design, assure excellent performance and minimize customer returns. They're perfect complements to the TVO-8370, a voltage-tuned local oscillator designed and priced for TVRO applications. Contact Avantek for the address and phone number of your nearest stocking distributor, who will provide detailed information on performance and on our competitive pricing for all these TVRO components.

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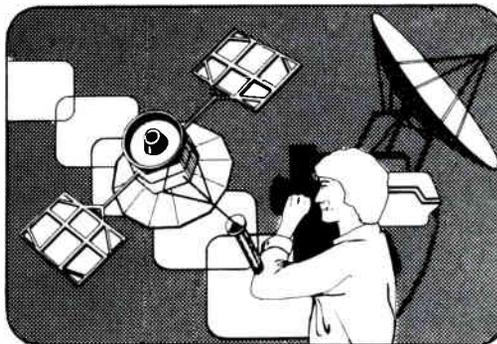
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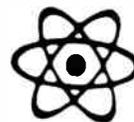
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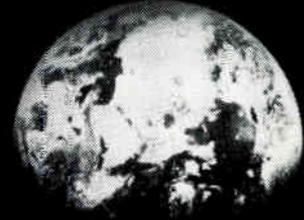
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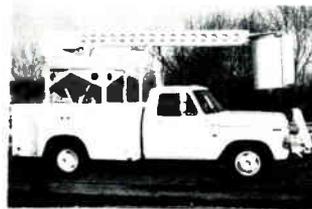
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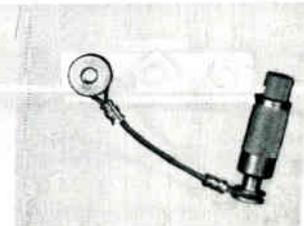
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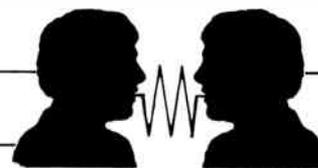
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## Lowering Set-Up And Maintenance Costs For Two-Way Systems

Two-way cable systems present many turn-on and maintenance problems not found in a conventional forward only system. The basic cause of the problems is the way an optimum system uses the familiar unity gain concept. This article will describe an innovative approach to their solution.

### The Problem

Reverse amplifiers are set to compensate for signal losses on their outputs. This means we set amplifier gains so that reverse amplifier inputs are constant, just the opposite of forward set-up procedures. Input-to-input level setting solves this problem (see figure 1). RA-C and RA-D could be set up so that RA-B would see identical input levels from each. RA-C and RA-D would then be compensating for the cable and equipment losses on their outputs. Now we get to the reason for this article. How do we accomplish this?

### The Solution

Essentially the goal of any reverse system set-up is to achieve unity gain from anywhere in the system all the way to the headend. If a tech at RA-x could inject a signal and, without assistance, tell at what level it arrived at RA-(x-1) he could set RA-x correctly. We need an old idea and three pieces of equipment and we can do just that.

First, the idea. Remember that when two signals are combined and detected we get their sum and difference. If we use two signals separated by only a kHz or two, the difference frequency can be heard on the speaker of a SLM or seen on a low-bandwidth oscilloscope. The difference frequency amplitude will reach maximum when both signals combine at equal levels.

For equipment we need two signal generators working in the reverse band. Both should be crystal controlled, and one needs to be battery powered. We need a frequency converter to change the two low band signals to an empty

frequency in the forward system band. We will also need a SLM or oscilloscope and detector, and an assortment of directional couplers and splitters. Figure 2 shows a general block diagram for the equipment.

Set-up procedures are as follows. First the converter and reference generator are set to convenient values. Then, monitoring at the headend test point, the portable RF generator is attached to "test input" and adjusted for maximum beat strength. I prefer a high-level sweep receiver (the oscilloscope and detector) for this. The maximum is very unambiguous. At this point we know that the two generator signals entered the combiner at equal levels. Now the portable generators' gain knob is locked in place and we move to Amp 1.

Set up Amp 1 as you normally would. Then insert the portable generator signal at the output of the station (input to the reverse amp) and monitor the ELS (Equal Level Signal) as you did at the headend. Adjust the reverse amp for maximum beat and you are done.

Amp 1 is now set so that any signal at its input will arrive at the headend at the same level it arrived at Amp 1. As you set up the forward system repeat the process. It works on feeders as well, but some modification of the portable generator level might be necessary depending on your system requirements. If you need to set reverse system slope as well, just double up on the equipment set to another frequency. Note that the technique is independent of the forward system response. The level comparison is made at the headend. The forward system just brings you the results. Also note that set-up errors at the test frequencies are not cumulative.

When you reach the end of the system you have finished a complete reverse system manual gain set-up.

*Martin Anding worked in cable for 10 years. He has held positions from tech to field engineer and chief engineer. He currently works for Sperry Univac in San Jose, California, in a disk drive development area.*

Figure 1

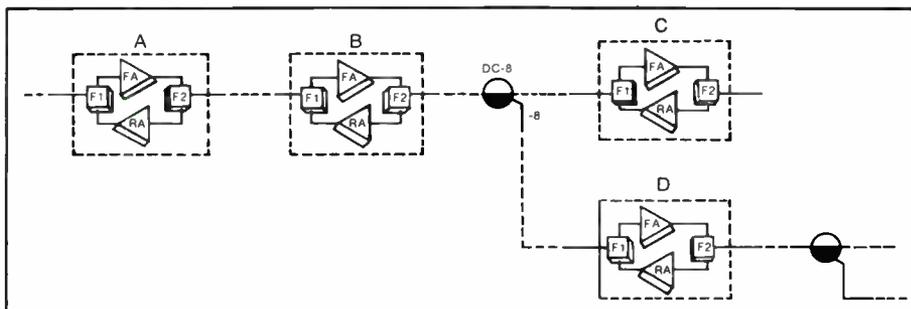
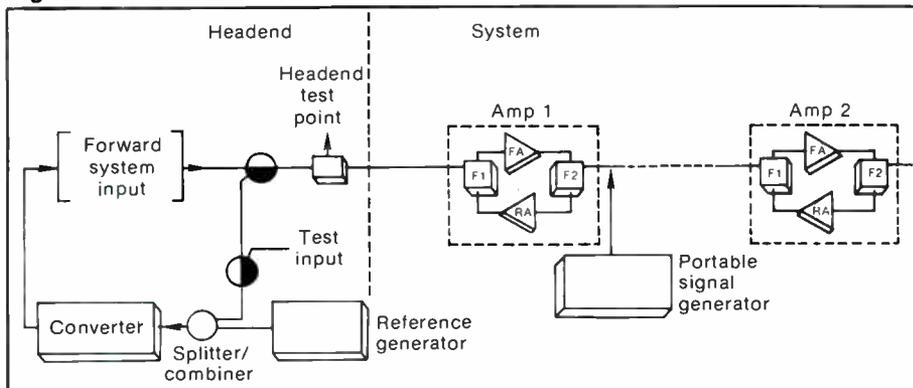
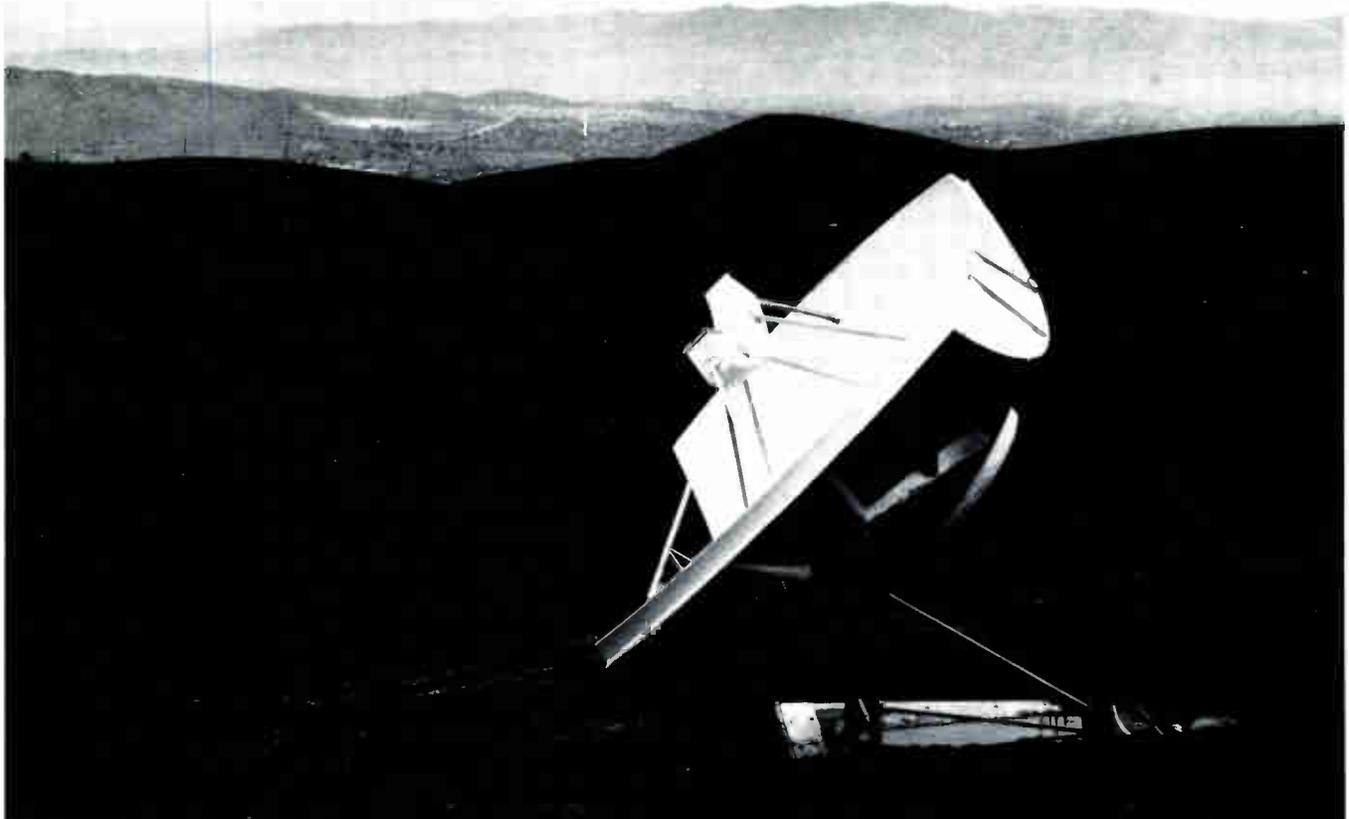


Figure 2



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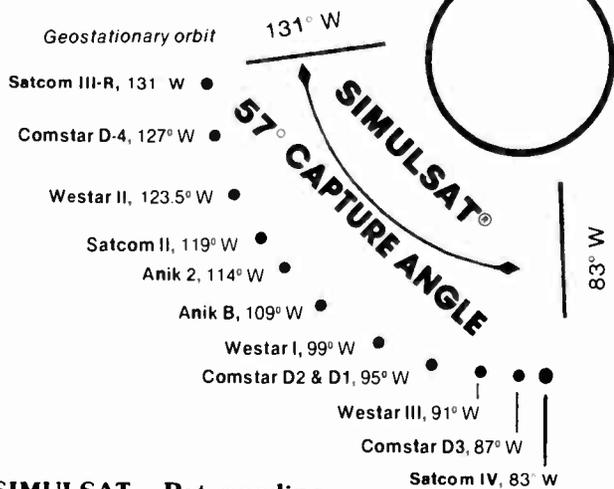
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## Canadian-U.S. Transborder Communications Issues Debated

WASHINGTON, D.C.—United States and Canadian communications officials came together May 15th to debate restrictions on the use of national communications media by the other country. Canada restricts Canadian companies from taking tax deductions for advertising on U.S. stations which, according to some U.S. broadcasters operating near the border, amounts to an export tax on American signals.

Many cable television operators in the U.S. are backing Congressional efforts to require cable ownership reciprocity with the Canadians in that U.S. companies are denied cable ownership across the northern border but Canadians can own systems in the U.S. Also U.S. satellite voice, data and video carriers seek to serve Canadian customers but while the FCC will permit it the Canadian government has yet to approve American satellite service. According to Canadian

officials in attendance, the question of satellite service will be given speedy attention especially for business data transmission as long as ways can be worked out to avoid violating international agreements and preserving the viability of the Canadian Telesat system, the country's only satellite carrier.

## Telidon Grants Awarded

OTTAWA, ONTARIO—In an effort to promote the Telidon videotex system, the Canadian Department of Communications is awarding \$10.5 million worth of grants to private industry and non-profit organizations.

Winners of the grants have agreed to match the government's investment by purchasing terminals designed and manufactured in Canada as opposed to the Prestel system, developed in England, and Antiope, the French system.

The most prominent grant went to Infomart for the development of Teleguide, a public access videotex system in Toronto. Grants were given to TV Ontario and Sheridan College to help develop

training programs for careers in videotex and a career guidance system that can be accessed via cable, satellite, microwave and broadcasting.

London Free Press and Cablesare Inc. received a grant for a joint venture that will use Telidon terminals for advertising and information distribution to shopping mall owners.

Other recipients were Toronto General Hospital, the city of Vancouver, the University of Quebec, the Advisory Council on the Status of Women in New Brunswick, the Canadian Automobile Association, the Council of Yukon Indians and the Federation of Saskatchewan Indians.

A spokesman for the Department of Communications said 52 grants were awarded, with more likely to come. In February 1981, the Canadian government said it would spend \$27 million for the grant program.

## France To Allow Private Cable And Pay TV

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sponsored bill passed the lower house of the French Parliament by a 281-162 vote allowing the introduction of privately owned cable television and pay television in France. After 99 hours of debate the vote was taken with the communists abstaining. With a socialist majority in the French Senate, its June 10th vote seems to assure passage of the bill.

The bill calls for the establishment of a private company, majority owned by the state, which will market French public TV programs abroad and co-produce programming with foreign partners. This arrangement replaces the three French public TV networks. Domestically, the government will no longer exercise monopoly status over French TV and radio but will retain authority over the broadcasting industry.

The French government hopes that these changes will stem the tide of foreign TV programming soon to be abundant in France through several European DBS systems. The DBS systems will be on-line within a five year period.

## Scientific-Atlanta Sells Earth Stations To Brazilian TV Network

ATLANTA, GEORGIA—Scientific-Atlanta Inc. has received an order from TV Globo Network, Ltd. for 33 satellite earth stations to be used to distribute television programming to stations throughout Brazil. The \$1.3 million order calls for delivery of the equipment to begin operations on June 1, 1982.

According to Scientific-Atlanta, satellite distribution of domestic and international TV signals is a growing worldwide business. The current order for this private sector network coincides with an evaluation now being made by the Government of Brazil of proposals for a national domestic satellite to be launched in 1985. The TV Globo system will transfer operation to the Brazil satellite when it becomes operational.

## Japanese TV Network Considering Antiope Adaptation

TOKYO, JAPAN—The development of High Definition Television (HDTV) and teletext transmission and display systems by the Japanese broadcasting system NHK seems to indicate that the network seriously intends to continue its plans to build teletext/videotex equipment compatible with systems in the United States and Europe. The Japanese are conducting experiments to condense the 30 MHz bandwidth requirements for the proposed 1125 scan line standard for HDTV which will allow the system to carry higher resolution graphic with increased data transmission capacity.

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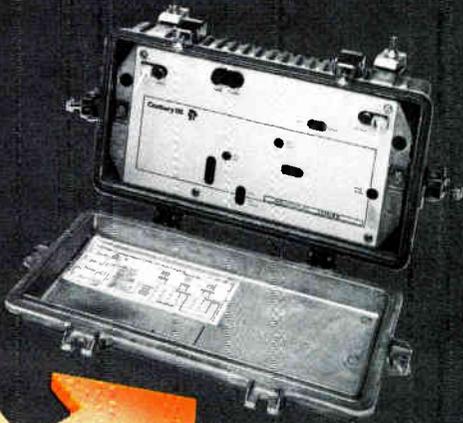
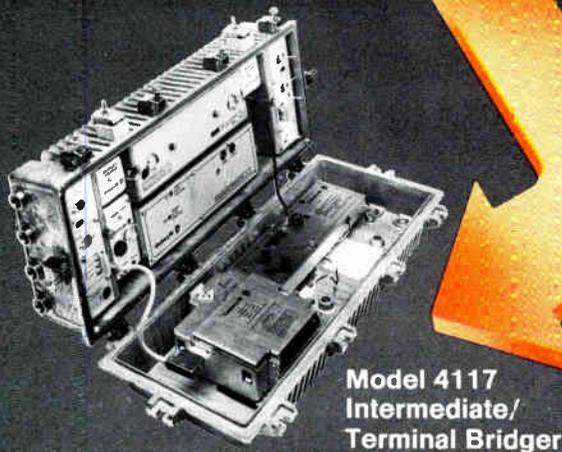
The rugged, portable 7272, with its long history of field performance, has built a reputation of reliability. With its frequency coverage of  $-5$  to  $405$  MHz without plug ins,  $\pm 0.5$  dB accuracy (typical) and sensitivity to  $-35$  dBmV it is an outstanding performer for any field application.

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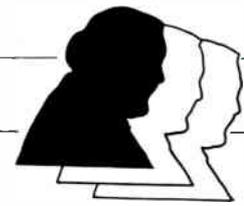
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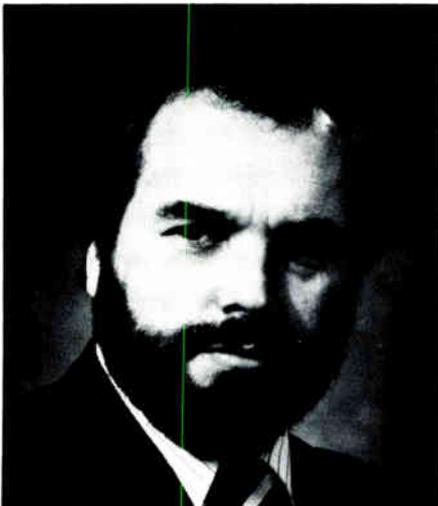


★ **Alan Hahn** has been appointed vice president, CATV, of **Stern Telecommunications Corporation** (STC). Previously, he was executive director of engineering, new market developments for Teleprompter Corporation and was responsible for all engineering and capital budgeting for new franchise applications.

Hahn has served as chief engineer for two of the largest cable television systems in the United States, the Manhattan Cable TV system in New York and the U-A Columbia Cablevision system in northern New Jersey. While at Manhattan Cable TV, he arranged their first efforts in data transmission on the cable television system.

Hahn has been involved in cable television since its inception and has served on the NCTA, IEEE and NYSCTA technical committees.

★ **Oak Communications Inc.** has appointed **Edward Joseph** as senior vice president, technical operations. Joseph joins Oak from General Electric Company where he spent 20 years in engineering management. Most recently, he was general manager for General Electric's Major Appliance Business Group and previously held assignments in GE's Aerospace Electronics Division and Medical Systems business.



*Robert Trowhill*

★ **Robert Trowhill** has been appointed general manager of **Trainor TVRO Ltd.** Trowhill was most recently division manager of a firm supplying equipment and systems to the broadcast, common carrier and CATV industries in Canada.

★ **R.W. Fensterbush** has been promoted to director of engineering at **Warner Amex Cable Communications** for the Cincinnati systems.

In this new position Fensterbush will be responsible for all operations and project engineering in the metro Cincinnati system.

Fensterbush joined Warner Amex in October, 1980 as systems engineer. An engineer in cable television for nearly 20 years, Fensterbush has served as chief engineer for cable systems in Abilene, Texas; Texarkana, Arkansas; Springfield, Illinois and Louisville, Kentucky. He is a graduate of the National Institute of Electronic Research and a member of the Society of Cable Television Engineers.

★ **Patrick Birney** has assumed the position of general manager of engineering with **Pioneer Communications of America Inc.** Formerly manager of systems engineering, Birney will now be responsible for all Pioneer full operational engineering.

★ **Richard Postal** has joined **Tribune Company Cable Inc.**, in the newly created position of director of new systems engineering. The appointment became effective April 1.

Postal has been employed as an independent engineering consultant in the cable television field. He also held positions with Viacom International and Television Signal Corporation with responsibilities for the engineering sections of franchise proposals, engineering technical designs and specifications and plant administration.

As director of new systems engineering, Postal will be responsible for developing the engineering sections of Tribune Company Cable's franchising proposals. In addition, he will have prime responsibility for the engineering in new systems.

A member of the Society of Cable Television Engineers, Postal received an M.B.A. from Golden Gate University and a Bachelor of Science degree in electronic engineering from Heald Engineering College in San Francisco.

★ **Anthony Gargano** has been appointed manager, control equipment product management for **RCA Commercial Communications Systems Division.** Gargano will be responsible for the acquisition, marketing and distribution of

all control equipment vendor products and systems which augment RCA's line of television cameras, video tape recorders and other TV studio equipment.

Prior to his appointment, Gargano was a product analyst in control equipment activity, a position he has held since joining RCA in 1979.



*George Erhardt*



*Rocco Lupo*

★ **Magnavox CATV Systems Inc.** has made four promotions within the company.

**George Erhardt** has been promoted to chief engineer of systems engineering. In this capacity Erhardt will have responsibility for project engineering, mechanical engineering, documentation, computer-aided design, engineering lab and model shop.

Also promoted were **Rocco Lupo** to chief engineer of analog engineering,

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**Floyd Vincent** to manager of system activities, and **Ronald Hazelton** to engineering department manager for documentation.

Lupo will be responsible for the design of analog circuits and systems, component engineering and competitive evaluation. Vincent's responsibilities include supervision of design and development of new product systems active and support of current product production. Hazelton's responsibilities are to create and maintain all documentation, ensure proper distribution of drawings, and develop manuals to support products in the company.



Tony LaGreca

Magnavox has also recently announc-

ed the appointment of **Anthony LaGreca** as manager of manufacturing. LaGreca will be responsible for the entire manufacturing, production and support facilities within Magnavox CATV. Prior to joining Magnavox CATV Systems, LaGreca served as manufacturing manager for Techtran Industries in Rochester, New York.

★ **W.E. "Bill" Stone** has been appointed vice-president of sales, CATV division at the **Winegard Company**. Stone was previously national sales manager.

**Pete Hasse**, who had been a CATV division regional manager, has been appointed Winegard's CATV sales manager. Hasse will supervise Winegard's CATV regional managers, and cover the northeast and southeast territories. He will also supervise all CATV trade shows.

★ **Oak Communications Inc.** has appointed **Graham Stubbs** vice president, technical operations, manufacturing. Stubbs was previously vice president of engineering. In his new position Stubbs will be responsible for all manufacturing engineering activities at the company's Carlsbad, California facility. This includes industrial, manufacturing, test and maintenance engineering, as well as advanced manufacturing technology.

★ The Jerrold Subscriber Systems Division of **General Instrument Corporation** has appointed a long-term employee, **Ron Ebert**, to head up its product service functions.

Ebert, with 23 years of production and management experience at Jerrold, has been promoted to national service manager. He had been serving as project manager for Jerrold Turnkey Operations.



Ken Kroge

★ **Kenneth Kroge** has been appointed to the position of product line manager for **GTE CATV Division**. Kroge will have complete responsibility for product marketing for Sylvania brand converters, security devices and addressable systems.

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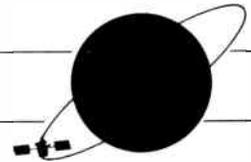
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<b>ACSN</b>	Weekdays Weekends	6:00 a.m. / 4:00 p.m. 6:00 a.m. / 1:00 p.m.	192* / #	Satcom III-R, #16	<b>The Movie Channel</b>		24 hrs	None	Satcom III-R, #5
<b>BET</b>	Fridays	11:00 p.m. / 2:00 a.m.	018* / #	Satcom III-R, #9	<b>Modern Satellite Network</b>	Weekdays Weekends	noon / 5:00 p.m. 8:00 a.m. / 1:00 p.m.	243* / #	Satcom III-R, #22
<b>Bravo</b>		8:00 p.m. / 6:00 a.m.		Satcom IV, #6	<b>MTV: Music Television</b>		24 hrs	None	Satcom III-R, #11
<b>CableText</b>		24 hrs	None	Satcom III-R, #6 Vertical Blanking	<b>National Christian Network</b>		6:00 a.m. / 8:00 p.m.	073* / #	Satcom IV, #7
<b>CBN</b>		24 hrs	None	Satcom III-R, #8	<b>National Jewish Television</b>		12-4 p.m. Sundays		Satcom III-R, #16
<b>CBS Cable</b>		4:30 p.m. / 4:30 a.m.	524* / #	Westar III, #6	<b>Nickelodeon</b>		8:00 a.m. / 9:00 p.m.	311* / # (E,C,M) 519* / # (P)	Satcom III-R, #1
<b>Cinemax</b>		24 hrs	None	Satcom III-R, #20 (E,C) Satcom III-R, #23 (M,P)	<b>North American Newstime</b>		24 hrs	None	Satcom III-R, #6
<b>CNN</b>		24 hrs	None	Satcom III-R, #14	<b>PTL</b>		24 hrs	None	Satcom III-R, #2
<b>Cable News Network II</b>		24 hrs	None	Satcom III-R, #15	<b>Preview Channel</b>	Weekdays	10:00 a.m. - 1:30 p.m.	207* / #	Satcom III-R, #21
<b>C-SPAN</b>		9 a.m. / 1 a.m.		Satcom III-R, #19	<b>Reuters</b>	Weekdays	4:00 a.m. / 7:00 p.m.	None	Satcom III-R, #18
<b>Daytime</b>				Satcom III-R, #22	<b>SIN</b>		24 hrs	None	Westar IV, #3x
<b>ESPN</b>		24 hrs	None	Satcom III-R, #7	<b>SPN</b>		24 hrs	None	Westar IV, #11x
<b>Eros</b>	Mon-Sat	12:00 p.m. - 5:00 a.m.		Westar IV, #10D 12 (Fri, Sat)	<b>Showtime</b>		24 hrs	None	Satcom III-R, #12 (E,C) Satcom III-R, #10 (M,P)
<b>Escapade</b>		8:00 p.m. / 6:00 a.m.		Satcom IV, #7	<b>Trinity (KTBN)</b>		24 hrs	None	Satcom 4, #17
<b>Eternal Word Television Network</b>		7:00 p.m. / 11:00 p.m.		Westar III, #12	<b>USA Network</b>		24 hrs	None	Satcom III-R, #9
<b>GalaVision</b>	Weekdays Weekends	8:00 p.m. / 3:00 a.m. 24 hrs		Westar IV, #12x	Calliope	Sundays	7:30 a.m. to 9:30 a.m.		
<b>HBO</b>		24 hrs	Program 729* / # Scramble 835* / # Duplication 940* / #	Satcom III-R, #24 (E,C) Satcom III-R, #13 (M,P)	The English Channel	Saturdays and Sundays	12 p.m. to 2 p.m.		
<b>HTN</b>		8:00 p.m. / 2:00 a.m.	207* / #	Satcom III-R, #21 (P)	<b>WFMT</b>		24 hrs	None	Satcom III-R, #3 Subcarrier
<b>HTN Plus</b>		4 p.m. - 4 a.m.		Satcom III-R, #16	<b>WGN</b>		24 hrs	None	Satcom III-R, #3
					<b>WOR</b>		24 hrs	None	Satcom III-R, #17
					<b>WTBS</b>		24 hrs	None	Satcom III-R, #6

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