CED™

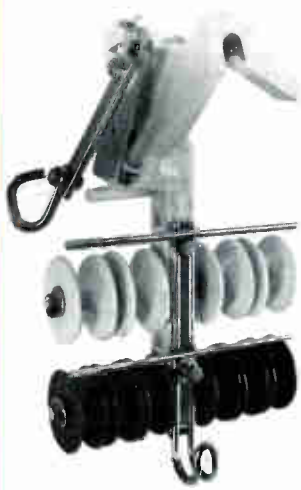
Special Western Show Report—Page 13

Communications Engineering Digest/The Magazine of Broadband Technology December 1982

GE Unveils Comband System At Western Show

Jackson introduces the tools you've asked for.

1036-4



1036-10

1092

1093

GRD-1 GRD-2

The new model 1036 multiple cable blocks feature a patented "single action" cable retainer. After placing the cables in the rollers, close the retainer with a single downward motion either by hand or from the ground with a lay-up stick.

The one piece cable block pusher, model 1092, has absolutely no moving parts to break or lose. Machined from polyethylene, it is lightweight, durable and quickly placed on and off the strand.

The new Jackson ground rod driver is manufactured in two sizes to drive both 3/8" and 5/8" diameter ground rods. Eliminate the need for sledge hammers and extra personnel. Prevent dangerous accidents while quickly driving ground rods up to 8 feet long in a fraction of the usual time.

We now offer the simplest, most versatile dual cable block on the market today. Model 1093 is designed to support and contain two cables up to 1" in diameter, and can also be placed on the strand with a lay-up stick. That's an unbeatable combination!

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Here's the converter with all the features you must have to add and hold subscribers. Everything from Optional External A-B Switch Controllers . . . to Most Favorite Channel Memory . . . to Parental Discretion Control . . . to Direct Channel Entry and Scan Up/Down. And much more . . . all made possible by the uniquely programmed microprocessor . . . the heart of our converter.

Top performance is the hallmark of MAGNA 6400's sophisticated 440 MHz design. For example, our PROM (Programmable Read Only Memory), unlike others on the market, is a **true** PROM. If plugged in improperly, the converter just won't work. A plug-in descrambler for any or all channels is optional when you order. Or you can add it later. Even the converter case is top performance rated. Made of high impact space-age plastic, it's fire retardant, UL approved and virtually indestructible.

Cordless remote control keypad is identical to the converter. Durable membrane keypads provide long-life operation.

MAGNA 6400 is a product of years of Magnavox CATV experience and technology, backed by the enormous technical resources of North American Philips Corporation. See a MAGNA 6400 demonstration in our Mobile Training Center when it's in your area.

Or to arrange for a personal demonstration by your Magnavox account executive, just call toll free 800/448-5171 or in New York State 800/522-7464.

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RECEIVE 48 CHANNELS FROM TWO SATELLITES WITH JUST ONE DISH.

Now cable operators can double their programming options at a fraction of the previous cost and bring the savings to their bottom line. The dual beam TVRO modification means you can receive signals from two adjacent satellites without going to the expense of installing a second dish.

Dual beam means you can add more service tiers, and that means an increased profit potential.

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United Video
Community Service Network
Reuters
Landmark Communications
Modern Satellite Network
C-SPAN

Galaxy I
Time Inc.
Group W Broadcasting Company
Times Mirror Satellite Programming
Viacom International
Turner Broadcasting System
SIN Television Network
C-SPAN

With the dual beam modification, you can receive Galaxy I and Satcom III-R simultaneously. These are the only two major cable satellites to be placed in adjacent orbital slots, and their transponders will be packed with the leading programmers in the cable industry. With dual beam, you won't be forced to choose between competing satellites ever again.

Here are just a few reasons why you will want the dual beam TVRO modification:

No purchase and installation costs for a second dish
No new real estate required
No perceptible loss of signal quality
Diversified programming and expanded service tiers
Reception of both Galaxy I and Satcom III-R, featuring the strongest programmers in the industry

To receive programming from these two cable birds, all that is required is a modification of the existing feed system. Reflectors from 4.5 to 7.0 meters in diameter with focal length to diameter ratio (f/d) from 0.3 to 0.5 can be accommodated. The modified feed system utilizes a limited offset from the paraboloid focal point to restrict the range between beams to less than 5 degrees and maintain high efficiency.

Once modified, the dual beam feed system will receive signals from 3.7 to 4.2 GHz. The loss of gain due to the production of two beams is on the order of 0.5 db.

Remember, other birds just can't match up to the Galaxy I/Satcom III-R package that you can receive with the dual beam modification. Get the most attractive mix of quality cable programming available. Save on the cost of upgrading your system. Get the dual beam TVRO modification and see what the skies have to offer.

For additional technical specifications and test data, contact these leading manufacturers:

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Earl Currier
Sales Manager
491 Oak Road
Ocala, Florida 32672
(904) 687-4633

SCIENTIFIC ATLANTA
Pat Miller
Marketing Manager
P.O. Box 105027
Atlanta, Georgia 30348
(404) 925-5000

For additional information contact:
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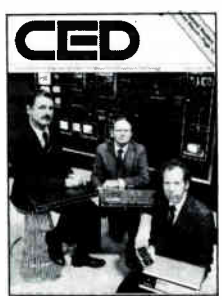
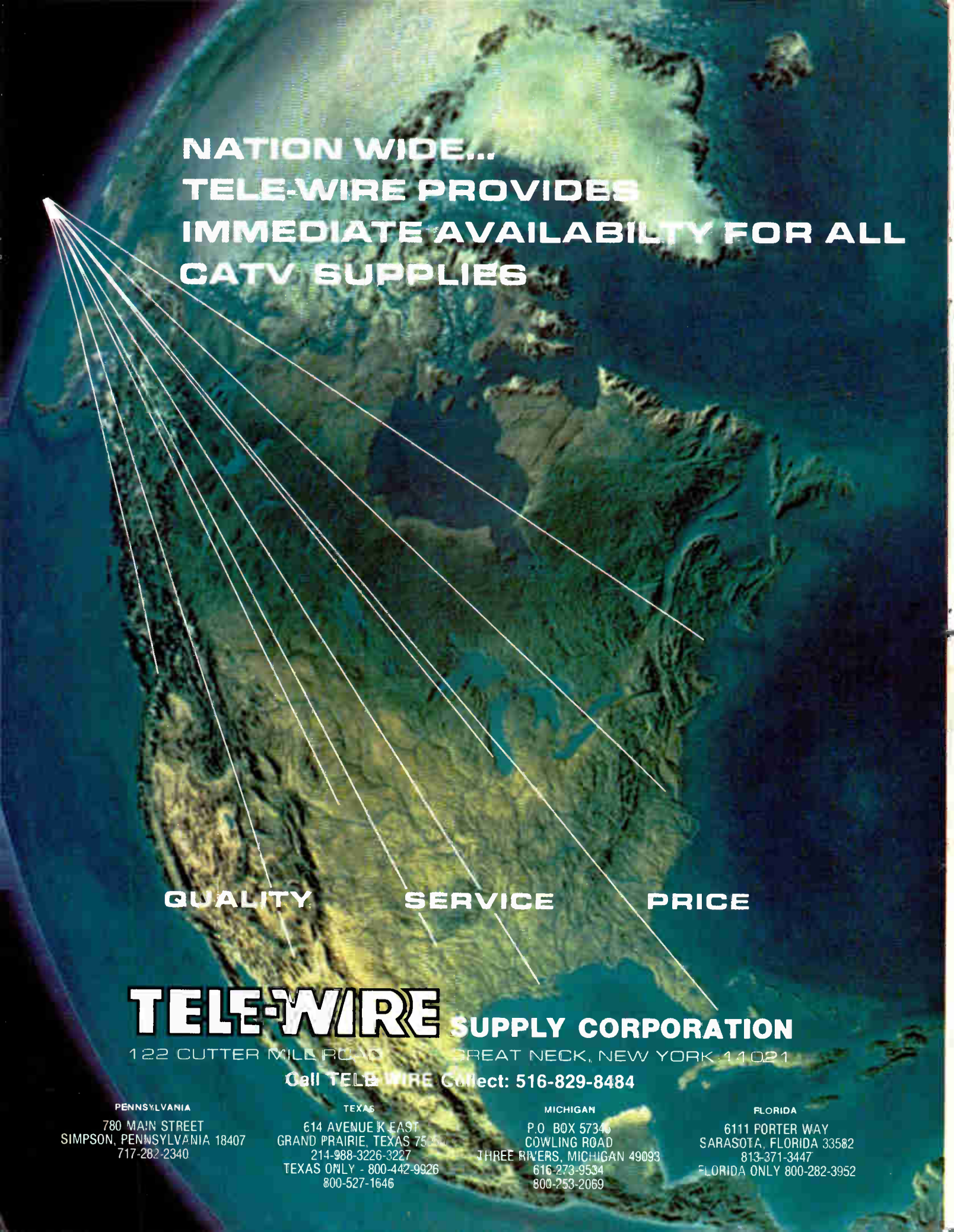


About The Cover:

General Electric engineers (from left to right) Hugh Willard, Ronald Hess and Scott Cutler show off their new baby, the Comband system, at the Western Show in Anaheim, Calif. See story, page 33. Staff photo by Rob Stuehrk.

 CED (USPS 300-510) is published monthly by Titsch Communications, Inc., P.O. Box Box 5727 TA, Denver, Colorado 80217. ©December, 1982, Volume 8, Number 12. Subscription Price: 1 year, $26.00; 2 years, $43.00; 3 years, $63.00. Outside USA orders add $8.00 per year postage; $30.00 per order processing fee. Second class postage paid at Denver, CO. **CED** is published on behalf of all parties, including the Society of Cable Television Engineers (SCTE). POSTMASTER: Please send form 3579 to P.O. Box 5727 TA, Denver, Colorado 80217. BPA membership applied for May 1981.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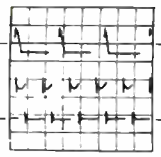

PEP Rally

CableData introduced a new, automatic voice processing device called PEP (Phone Entry Processor) on the opening day of the Western Cable Show . The PEP system uses synthesized voice response technology to allow customers to communicate directly with the operator's database. Customers respond to queries from the PEP system by pressing appropriate pushbuttons on their telephones. The voice synthesizer, which has a 1,300 word vocabulary, can be configured for a number of different messages, or even dialects. CableData officials admit that the system is still a prototype and that the voice synthesizer needs additional work. However, the company soon expects to finish developing a method for controlling the tone and pitch of the computer's voice. Consequently, an operator who wants a southern belle, a seductive woman or a friendly, back slappin' Texan to handle pay-per-view orders, can have his wish fulfilled.

MCI Develops Two-Way System

In a luncheon speech on the closing day of the Western Cable Show, MCI Communications Chairman William McGowan said that his company was developing a two-way communications system that would be able to provide cable television subscribers with direct access to his company's long distance telephone network. Soon, MCI will embark on a joint project with Cox Cable in Omaha, Neb., to test the system's capability for long distance voice access. Citing the need for both a local distributor, "who can get us down the block and into the home at a good price," and the need for "a way to reach the mass market without the interference of the telephone companies," McGowan stressed that there is a natural synergy between a cable company and a company like MCI. MCI and Phasecom Corp. have been developing a single-line modem that will permit business and residential users to switch their telephone connections from the local phone company to a two-way cable system.

Off The Floor

At least two of TOCOM's technicians didn't leave Anaheim immediately after the Western Show closed. will stay behind to bring a TOCOM 55 Plus Addressable System on line for Storer Broadcasting's CATV franchise in Anaheim. Storer purchased the addressable hardware that TOCOM was going to use in their booth, before the show began, and they are going to take delivery right off the convention floor. The system includes a TOCOM 55 Plus ACS with five headend video processors, a Hewlett Packard 3000 series computer and disc drive, four CRTs for addressing and programming and 10,000 5504B one-way addressable converters. The system will be installed for approximately 35,000 subscribers.

Bouncing Baby Bell

American Bell, the new AT&T unregulated subsidiary, has been forced to rename its service offering Advance Information Systems/Net 1000. Ungermann-Bass, which calls its own service Net 1, objected to the original name, AIS/Net 1, given to the service by American Bell. Throughout the divestiture, AT&T argued for deregulation, emphasizing its wish to operate in a fair and competitive environment. To compete successfully in an open market requires knowledge of the existing competition. Just how American Bell will fare in such an environment remains to be seen. After all, American Bell is not yet even 1 year old.

Pioneer To Announce FM Converter

Pioneer Communications of America will soon announce its Premium FM converter. This converter is targeted for cable systems that offer stereo FM simulcasts of the audio portion of their programming and premium stereo FM radio via a second hookup. Essentially a block converter with a crystal-controlled oscillator, the Premium FM converter has a 3-position switch that the subscriber can use for the "A" block and "B" block and for one position for off-air reception of local broadcast FM stations. The advantage this converter offers the cable operator is premium FM transmission that can be configured in any frequency allocation scheme desired for bandwidth efficiency.

QUBE Ahead In Cincinnati

Robert Montgomery, president and general manager of the QUBE system here, recently reported to Cincinnati city officials that, despite obstacles such as inadequate supplies and wet weather, Warner Amex Cable Communications is ahead of its construction schedule for the QUBE system. A total of 429 miles have been activated, making QUBE two-way interactive services available to half of Cincinnati's 44 traditional neighborhoods. Originally, Warner Amex had committed itself to activating 390 miles by October 19. According to Montgomery, "In order for 390 miles to be activated and ready for service to subscribers, a total of 650 miles of overall construction on the streets of Cincinnati needed to be constructed within 165 days." Warner Amex now plans to complete the entire system of 772 miles before the February 1984 franchise completion date.

Robot Sees Through Fiberoptic Eyes

A robot has been developed in Japan that "sees" with fiberoptic "eyes." A prototype of the robot, constructed by Sumitomo Electric Corp. of Tokyo, has two fiberoptic bundles, each containing 30,000 single-mode fibers that transmit images to a microcomputer—located above an operating arm. Voice commands such as "pick up the round object" are accomplished in about 10 seconds, the time it takes to compare the spoken image with the microcomputer pattern of squares, circles and triangles. A second generation prototype, expected to be developed next year, will feature two three-fingered arms with fiberoptic eyes on each finger. The eyes will contain 250,000 fibers, 3 to 4 micrometers in diameter. While this prototype's response rate will be reduced to 0.1 second, its ability to recognize complex shapes will be increased.

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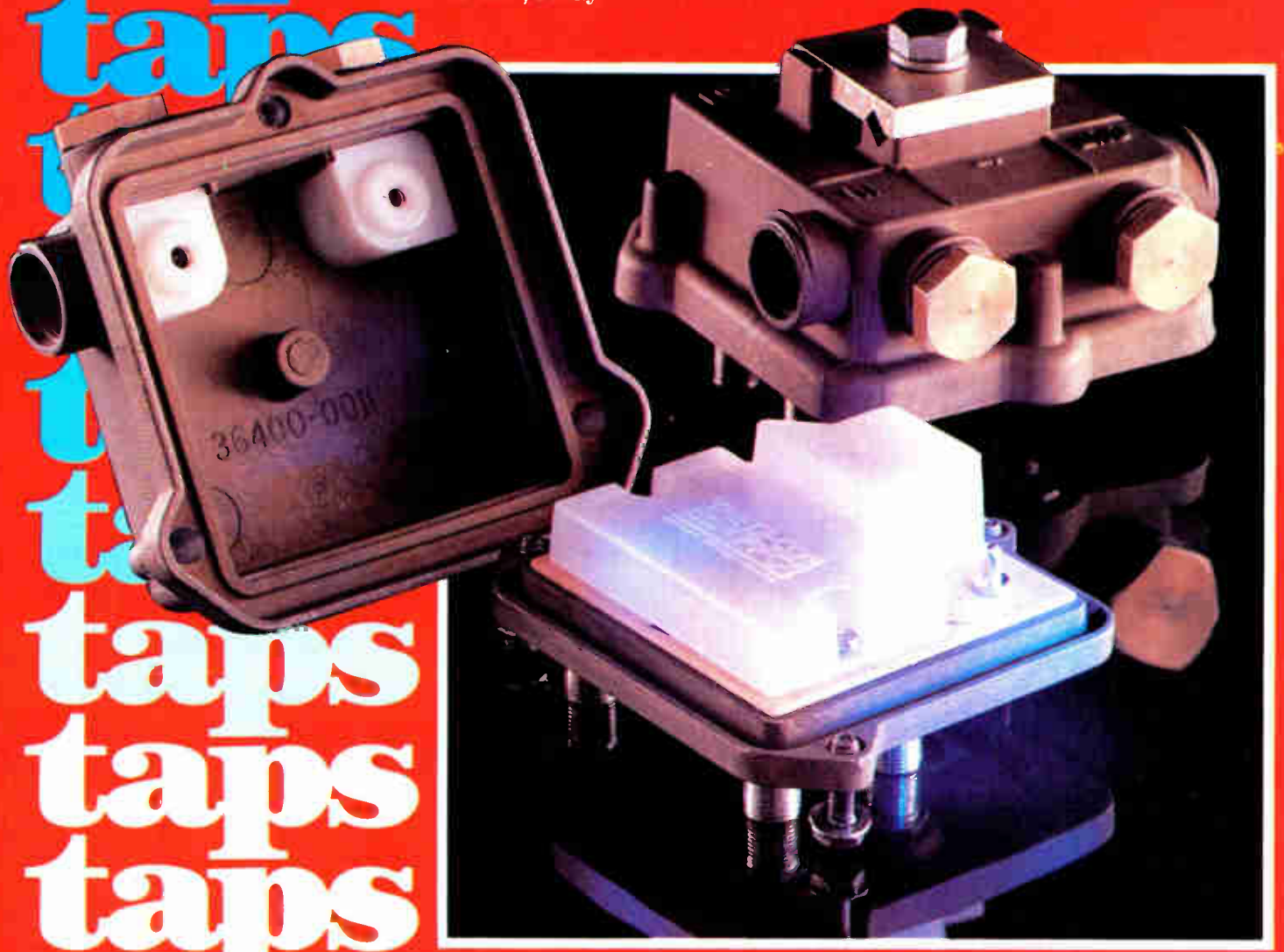

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Seminars

December

1-3: The Center for Advanced Professional Education (**CAPE**) will present a seminar on network communication protocols in Albuquerque, N.M. For more information contact CAPE, (714) 633-9280.
2-3: A seminar on "Understanding and Using Computer Business Graphics" will be presented by **Frost and Sullivan Inc.** in New York City. Contact Carol Sapehin, (212) 233-1080.
6-11: An advanced technical training seminar sponsored by the **Community Antenna Television Association** will be held in Orlando, Fla. Contact the CATA Engineering Office, (305) 562-7847.
7: The **Rocky Mountain Chapter of Women in Cable** will hold a technical workshop at the Jones Intercable boardroom in Denver. Contact Barbara Lukens, (303) 773-3411.
7: ***Satellite Weeks*** "Satellite Summit Conference" will be held at the Watergate Hotel in Washington. Contact Jonathan Miller or Barbara Pratt, (202) 872-9200.
8: A meeting of the Appalachian Mid-Atlantic group of the **SCTE** will be held in Carlisle, Pa. The meeting will feature a discussion of feed forward technology and insulation products, and the election of officers for 1983.
8-9: A **Blonder-Tongue** "MATV/CATV/TVRO Technical Seminar will be held in Phoenix, Ariz., in conjunction with J.R. Morgan Agency. Contact Chuck Fitzer, (415) 449-0547.
8-10: Magnavox CATV Systems will be conducting a field training seminar with its Mobile Training Center in Los Angeles, Calif. For more information contact Laurie Venditti, (800) 448-5171 or (800) 522-7464.
8-10: The Center for Advanced Professional Education (**CAPE**) will present a seminar on network communication protocols in Pittsburgh, Pa. For more information contact CAPE, (714) 633-9280.
9-10: A seminar entitled "Interactive 2-Way Cable TV Technologies and Opportunities," sponsored by **Telestrategies Inc.** will be held at the Key Bridge Marriot in Washington. For information call (703) 734-7050.
13-15: Magnavox CATV Systems will be conducting a field training seminar with its Mobile Training Center in Los Angeles, Calif. For more information contact Laurie Venditti, (800) 448-5171 or (800) 522-7464.
15-17: The Center for Advanced Professional Education (**CAPE**) will present a seminar on network communication protocols in Baltimore, Md. For more information contact CAPE, (714) 633-9280.
20-22: The Center for Advanced Professional Education (**CAPE**) will present a seminar on network communication protocols in Minneapolis, Minn. For more information contact CAPE, (714) 633-9280.

January

4-6: The fourth Western Conference and Exhibition of the **Armed Forces Communications and Electronics Association** will be held at the San Francisco Hilton and Tower. Contact (703) 578-1037.
7-9: An SMATV seminar for "start-up" companies sponsored by **Eagan & Associates** will be held in Tampa, Fla. Contact (904) 351-5400.
12-14: Magnavox CATV Systems will be conducting a field training seminar with its Mobile Training Center in San Francisco, Calif. For more information contact Laurie Venditti, (800) 448-5171 or (800) 522-7464.
17-19: Magnavox CATV Systems will be conducting a field training seminar with its Mobile Training Center in San Francisco Calif. For more information contact Laurie Venditti, (800) 448-5171 or (800) 522-7464.
24-26: The **National Institute for Low Power Television** is sponsoring LPTV West at the Disneyland Hotel in Anaheim, Calif. Contact Frank Camoro, (203) 852-0500.
25-27: A **Blonder-Tongue** "MATV/CATV/TVRO Technical Seminar" will be held in Atlanta in conjunction with Adams and Associates. Contact Tom Adams, (919) 272-6838; or Gloria Rothfuss, (201) 679-4000.
27-28: A seminar on "Future Trends in Broadband Networks" sponsored by **Phillips Publishing** will be held at the Marbury House in Washington. Contact Dianne Pontisso. (301) 986-0666.
31-Feb. 2: Communication Network '83 will be held at The Rivergate in New Orleans. Contact Louise Myerow, (617) 879-0700.

February

2-4: The annual convention of the **Texas Cable TV Association**, the Texas Show, will be held at the San Antonio Convention Center. Contact the TCTA, (512) 474-2082.
8-9: The annual meeting of the **Arizona Cable Television Association** will be held at the Phoenix Hilton Hotel. Contact the ACTA, (602) 257-9338.
9-11: Magnavox CATV Systems will be conducting a field training seminar with its Mobile Training Center in Denver, Colo. For more information contact Laurie Venditti, (800) 448-5171 or (800) 522-7464.
9-11: The **Arkansas Cable Television Association** annual convention will be held at the Excelsior Hotel in Little Rock. Contact (501) 661-7677.
14-16: Magnavox CATV Systems will be conducting a field training seminar with its Mobile Training Center in Denver, Colo. For more information contact Laurie Venditti, (800) 448-5171 or (800) 522-7464.

April

25-27: The **International Association of Satellite Users** will sponsor SATCOM '83 at the Hyatt Hotel in Orlando, Fla. Contact Ann Roark, (703) 759-2094.

May

6-8: The **Society of Cable Television Engineers** will hold its first cable TV hardware exposition, Cable-Tec Expo, at the Dallas Convention Center. Contact SCTE, (202) 293-7841.

Looking ahead

1983

April 10-13: National Association of Broadcasters convention, Las Vegas Convention Center.
June 12-15: National Cable Television Association convention, Houston.
August 11-14: Community Antenna Television Association's CCOS-83, Arlington Hotel, Hot Springs, Ark.
September 8-10: Eastern Show, Georgia World Congress Center, Atlanta.

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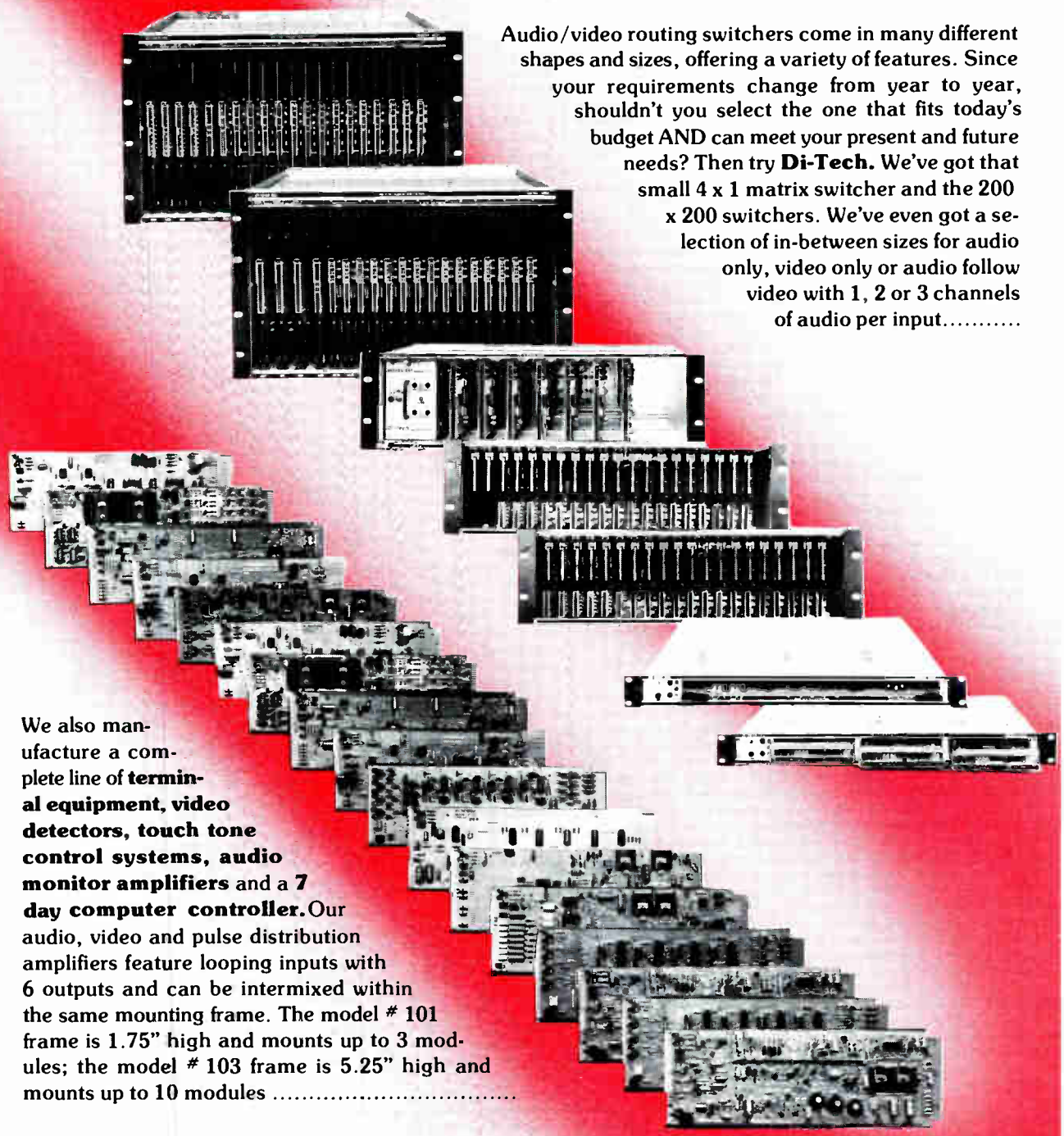

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Editorial

The Best Of The West

Many people in the cable television industry feel that the Western Cable Show is the best annual cable convention of the year. And they certainly have ample reasons. The Western Show has evolved into an annual show with unique appeal, distinguishing it from all the others. First of all, for myself and many other Easterners, it provides a break from the impending onset of winter. The climate of Southern California is a welcome experience any time of the year.

But more importantly, the Western Show is a time for cementing business deals and for rekindling old friendships and professional associations. The business side is tough work, but its rigor is redeemed by the pleasure of reuniting with friends from distant parts of the country.

The attendance at this year's Western Show was up from last year's figure of 10,500 to around 11,000. Despite this increase, many exhibitors said that business was down and booth traffic was off. There were several notable exceptions, though.

The General Electric booth was jammed throughout the conference. The excitement centered on GE's latest hardware offering, the Comband System. Comband (see cover story, page 33)—which GE is touting as a transmission system that doubles the capacity of the 6 MHz bandwidth normally used for one signal—evidently has created excitement on Wall Street. During the convention's three days, the GE stock was one of the most actively traded blue chips. In a flurry of trading, GE's stock went up a couple of points. Reuters and the *Wall Street Journal* reported that the trading may have had something to do with the introduction of Comband.

Interest was high at the Pioneer Communications booth and the Wegener Communications booth, as well. Pioneer and Wegener jointly announced that they will package and market hardware for secure, premium FM audio in stereo from satellite to set-top. The new hardware in this configuration, apart from the successful Wegener headend stereo processor system, is a block converter for subscriber site use, which selects either "A" block of premium stereo services, "B" block of same, or transmissions of local over-the-air FM services received via an antenna.

While M/A-COM's dual-beam earth station antenna feed continued to be an item of interest, the introduction of a new scrambling system through its subsidiary Linkabit attracted further attention. Dubbed the Secure Satellite Television Scrambling System (SSTSS), M/A-COM officials admit the unwieldy name will be changed. The system utilizes the data encryption standard (DES) algorithm, a digital technique that scrambles the analog by taking sections of scan lines and restructuring them on different lines. It does so in randomly alternating ways to prevent any attempts to defeat the scrambling.

Times Fiber Communications announced an $8 million agreement to enter into a contract to design, manufacture and construct the world's largest fiberoptic cable television system for Alameda, Calif., a franchise of United Cable Television. Approximately 120 miles of plant will be constructed—subject to the approval of the Alameda City Council—which will provide 120 channels to 24,392 homes passed. If approved, construction will be scheduled for completion in late 1983.

Booth traffic was also high at the Phasecom exhibit. A demonstration using Phasecom equipment was conducted by MCI, the long distance telephone resale company. The demonstration showed that long distance telephone calls could be transmitted over cable plant. Attendees at the Western Show could call long distance for free anywhere in the country that MCI goes. Phasecom also introduced a modem and other equipment for data networking on cable.

A lot of attention was given to the distributing processing and addressable control techniques offered by Gill Management Services of San Jose, Calif. Using a large host computer located in San Jose, GMS demonstrated that it is capable of controlling addressable pay tiers by leased telephone lines for communication with minicomputers at the cable plant site. GMS also announced it will develop software for Scientific-Atlanta's Addressable Management System (AMS).

There were, of course, many exciting developments and new announcements at the Western Show (see special Western Show report, page 13).

George Dell

CED

Volume 8, No. 12

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Through microprocessor techniques, the meter is preprogrammed for a total of 120 channels, 60 in the standard configuration, and 60 in the HRC system. These channels may be selected, either video or audio, by direct keyboard entry on the SAM IIID.

Accuracy is ±0.5 dB over the -40 dBmV to +60 dBmV amplitude range. True digital tuning covers the 4 to 450 MHz range.

Of course, deep down, this is still a SAM. That means it has all the performance and durability that goes with the name.

SAM IIID also has a built-in calibrator, hum measurement system, and spectrum analyzer. All in a compact, weather-tight case. And all for just $2395.

Isn't it time you got off the line, and put SAM IIID on it? 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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When SAM IIID goes on the line, you don't have to.

Oak And IBM Show Bi-Sync Link

ANAHEIM, Calif.—Here at the Western Show, Oak Communications and IBM demonstrated a bi-synchronous connection between a business computer and addressable CATV controlled equipment. An Oak TotalControl addressable system, located in the Oak booth, was linked to an IBM system 34 business computer, located in the IBM booth. This link was accomplished through the use of Oak's Interfacable Addressing System (IAS) software package. The two systems use a bi-synchronous communications protocol to exchange messages through a telecommunications connection and a modem eliminator.

The booth connection demonstrated the type of bi-synchronous link between a headend computer and a remote billing computer that Oak previously had developed in the field. According to, IBM spokesman, the method demonstrated here at the Western Show was not in its final form. However, he added, the demonstration showed the method's capabilities for driving an addressable cable system. The IBM system 34, which controls subscriber decoders through the IAS software, provides billing system control and immediate headend changes in subscriber and decoder profiles.

CableData Announces PEP System

ANAHEIM, Calif.—CableData introduced a new, automatic voice processing device, called PEP (Phone Entry Processor), on the opening day of the Western Cable Show held here. Through the use of tandem on-line information systems and one-way addressable home terminal units, the PEP handles large volume pay-per-view customer orders without the assistance of customer service representatives.

CableData utilizes voice response technology to allow customers to communicate directly with the operator's database. The PEP uses a human voice-synthesized vocabulary to ask pay-per-view customers specific questions regarding their choice of programming. Customers respond to questions asked by the PEP system by pressing appropriate pushbuttons on their telephones.

While customers are communicating with the Tandem computer, the system checks various information sources relating to the status of the customers' account—payment history, account number, account status, etc.—and authorizes the deliver of special events.

CableData's system capitalizes on current one-way addressable technology. Even though PEP was designed to be a peripheral to CableData's on-line management information systems and one-way addressable home terminal units (HTU), it is also compatible with addressable converters from other manufacturers. However, use of PEP with CableData's HTUs ensures subscribers that they will be able to visually confirm every step of the pay-per-view transaction. In ordering a special event, the customer must respond to a randomly generated code from the Tandem computer, and that verification number is only available through the HTU.

CableData representatives claim that they serve over 900 cable companies with 12.5 million subscribers. While the cost of the PEP system may be prohibitive for some of the smaller cable system operators, CableData claims that small system operators may be able to plug into large regional PEP systems.

On the lighter side, the voice synthesizer, which has a 1300-word vocabulary, can be configured in a number of different messages, or even dialects. So, any operator who wants a friendly, back-slappin' Texan to take customer pay-per-view orders can have his wish fulfilled.

Wegener And Pioneer Announce Stereo Audio Venture

ANAHEIM, Calif.—Wegener Communications and Pioneer Communications announced, on the opening day of the Western Show, a joint venture under which the two companies will package and market a delivery system for a stereo audio-pay cable service.

According to Ned Mountain, Wegener marketing manager, the new venture will, "provide a complete delivery system for premium cable stereo audio from satellite to set-top." Included in the Pioneer/Wegener package will be the Wegener plus-in stereo processor system and the Pioneer stereo security converter for off-air, satellite or locally originated stereo audio programming options.

Both Mountain and Tom Calabro, general manager of sales for Pioneer, said the package not only contains all the hardware needed to bring stereo audio services into the headend but also to process and deliver these services via cable to subscriber stereo equipment. Calabro emphasized that the Pioneer converter has been designed to secure the signal from theft.

The Pioneer/Wegener system will use frequencies outside the unprotected FM bandwidth and convert them for subscriber pickup through the Pioneer stereo security converter. A joint release from the companies says that the system will permit utilization of the spectrum not being used in most cable systems. The release adds that audio delivery is one-tenth the cost of a video/audio service and that programmers will be able to use the new system to deliver financial and educational news and weather services, as well as other forms of entertainment.

Equipment is expected to be available in the first quarter of 1983.

M/A-COM Linkabit Introduces New Headend Scrambling System

ANAHEIM, Calif.—On the opening day of the Western Show here, M/A-COM Linkabit introduced its headend scrambling system for DBS and SMATV applications, while M/A-COM Video Satellite Inc. unveiled its new double feed for parabolic antennas.

Dubbed the Secure Satellite Television Scrambling System, M/A-COM officials admit that the scrambling system is so new they haven't yet come up with its name. According to company officials, the system utilizes the data encryption standard (DES) algorithm, a digital technique that scrambles the analog by taking sections of lines and restructuring them on different lines. The company describes the system's transmission of both video and audio as very secure and each system as fully addressable.

M/A-COM's new double feed allows for the simultaneous reception of signals from two adjacent satellites through the use of a single parabolic antenna. Each of the two prime focus feeds accommodate two LNA's or LNB's for reception of both vertically and horizontally polarized signals from one of two satellites within a 4-degree arc. Each feed may be independently rotated for polarization adjustment. These dual feeds are designed for use in M/A-COM antennas, but kits are available.

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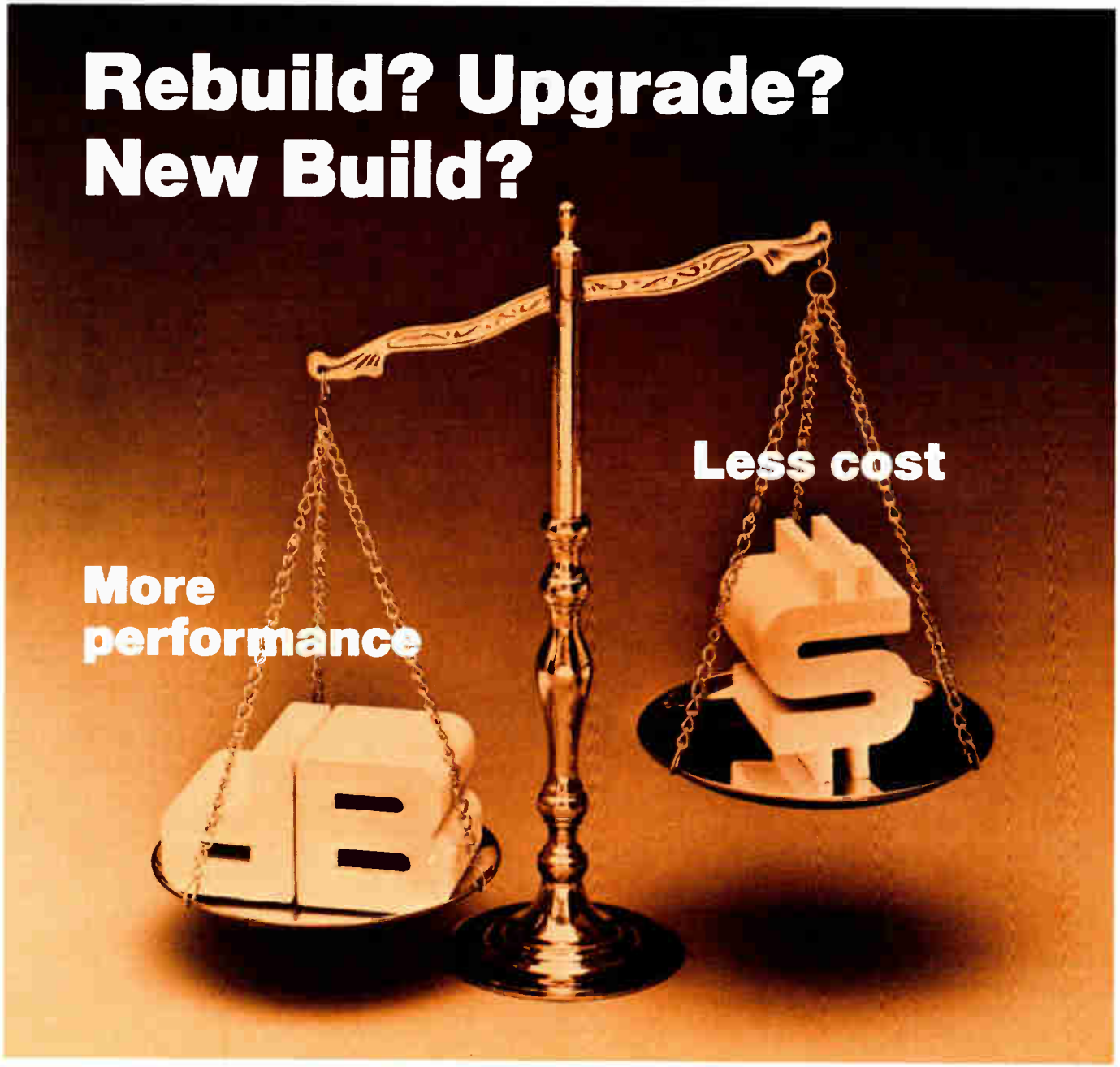

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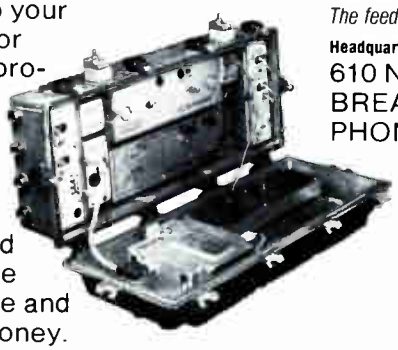

Century III

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Times Fiber Receives $8 Million Contract

ANAHEIM, Calif.—An $8 million agreement to enter into a contract to design, manufacture and construct the world's largest fiberoptic cable television system for Alameda, Calif., franchise of United Cable Television has been received by Times Fiber Communications Inc., an affiliate of Insilco Corp. The proposed system is subject to approval of the Alameda City Council.

The agreement calls for turnkey construction of approximately 120 miles of plant, which will make 120 cable television channels available to 24,392 homes in this San Francisco Bay community. Construction is scheduled for completion in August 1983.

According to a joint announcement by TFC and United, the Alameda Mini-Hub™ System will feature an expanded "horizontally" distributed network design to serve single-family houses as well as large multiple dwellings. The computerized fiberoptic network will be two-way addressable.

The Alameda Mini-Hub system will include a central office computer system that controls the memories in Mini-Hub local switching units and verifies requests from viewers. The system has complete diagnostic capabilities.

Gene Schneider, CEO of United, said "We selected this system because it will enable our Alameda operation to provide not only basic cable service and premium program packages, but also impulse pay-per-view, voting and opinion-polling, teleshopping and provision for home security, and other interactive services in the future. Alameda will be one of the most advanced cable systems in America."

Lawrence DeGeorge, chairman of TFC, said, "The Alameda agreement is unique not only because it is the largest fiberoptic cable television installation in the world, but because it will feature an expanded version of the Mini-Hub System to serve single-family homes as well as multiple dwellings. Our pilot installation of the Mini-Hub System in New Britain, Conn. for United proved that the Mini-Hub System is both economically and technologically feasible."

To operate the Mini-Hub System, an Alameda subscriber will use a keypad instead of a set-top converter to order a program. The keypad allows a subscriber to select any channel for viewing. In addition, it provides a method by which parents can control program selection by use of a code lock. At the touch of a button, the keypad generates a signal which is transmitted through a fiberoptic cable network to a Local Distribution Unit (LDU). The LDU then checks its memory to see if the subscriber is authorized to receive that program. If authorized, the desired program is then sent to that subscriber, and the entire transaction takes place in a fraction of a second.

The installation of the Alameda Mini-Hub System will be done by Commco Construction Co. of El Campo, Texas. Commco has participaed in several other TFC Mini-Hub projects and has trained technicians skilled in the installation of fiber optic systems.

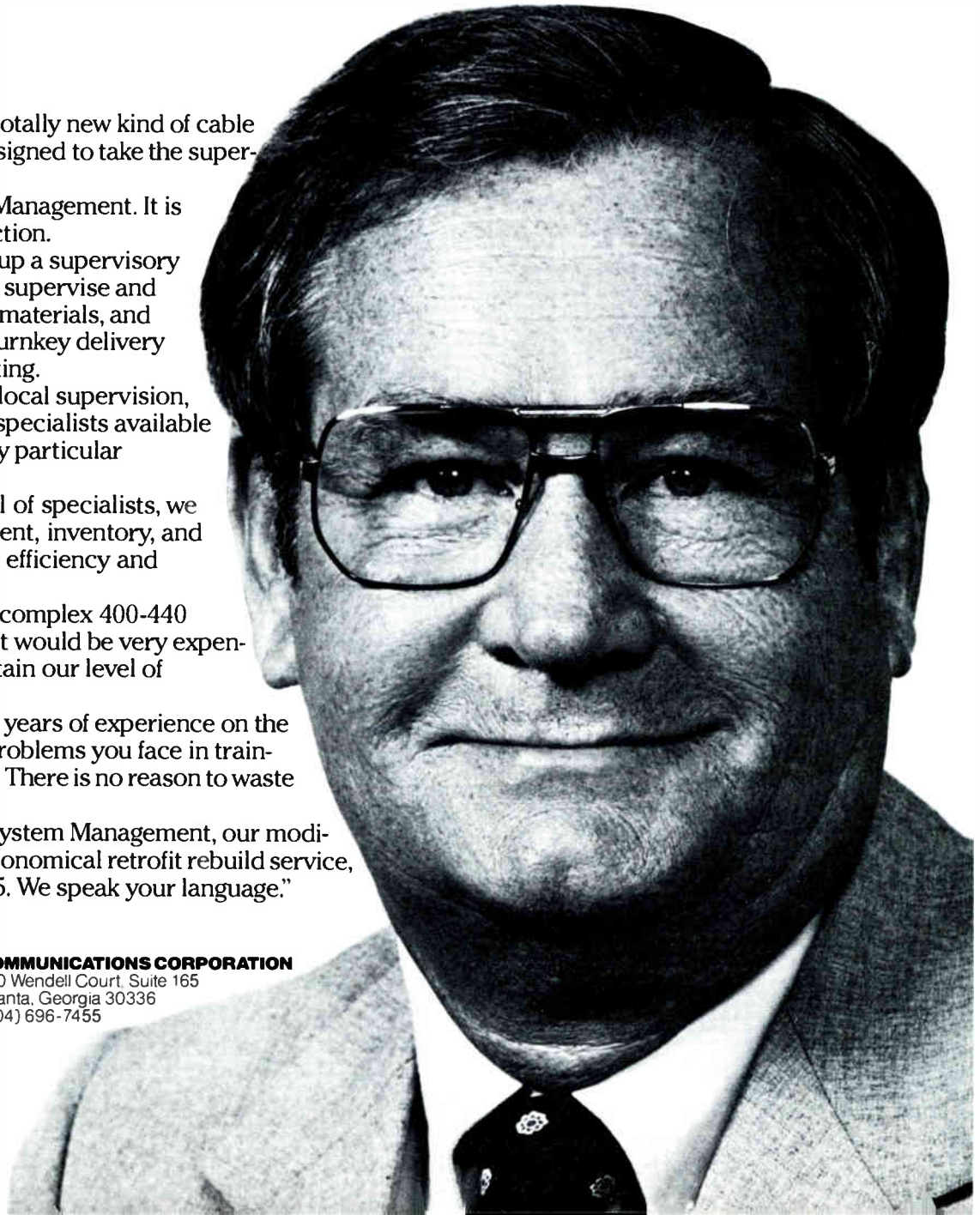
GE Unveils Comband System At Western Show

ANAHEIM, Calif.—General Electric Television displayed for the first time its newest product, Comband, here at the Western Show. Comband is a bandwidth compression system, which has applications for cable television, multipoint distribution systems (MDS), satellite master antenna television (SMATV), direct broadcast satellite (DBS), amplitude modulation microwave links (AML) and subscription television (STV).

When used for CATV, Comband synthesizes the headend processing of two channels of standard NTSC signals, normally requiring 12 MHz, into a combined signal requiring only 6 MHz for transmission. At this point, either a one-way or two-way addressable converter is used to reconstitute this signal into the original two signals. These two signals then are presented to the subscriber's TV receiver. Through this procedure, the cable operator, is able to double his cable

"MSO's have enough worries. Construction shouldn't be one of them."

Bill Pitney, Executive Vice President/Corporate Development.



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system's channel capacity without incurring the financial cost of having to rebuild his plant.

To process any two channels of signals at the headend, operators must use a frame synchronizer and a Comband video processor. Addressability is accomplished by means of an interfacing network: a business computer is interfaced with an addressing control computer, which, in turn, is interfaced with a Comband addressing modulator. This modulator commands the subscriber terminal. The cable plant is relatively transparent to the generated Comband transmissions.

Comband transmissions are not compressed bandwidth signals in the traditional sense. Instead, the Comband video processor interleaves scan lines of two NTSC signals, which then are frame synchronized. In this stage, luminance and chrome elements are combined together in a process, which reduces their natural redundancy. At the same time, the difference in luminance of these scan lines is used to improve vertical detail. Processing is accomplished by comparing and then combining both adjacent lines into one composite line. As a result, half of the original lines in each picture are "empty," and the two pictures can be time-interleaved into a single 525 line video signal. The new signal, containing the information originally available in two separate pictures, now is ready to be transmitted over a single 6 MHz channel. Two closely-spaced FM carriers are used to continuously transmit the audio from both multiplexed programs, addressing commands are sent on a separate carrier.

Texscan To Supply Equipment For Eight Group W Systems

ANAHEIM, Calif.—Texscan Corp. announced here at the Western Show that Group W has placed an order with Theta-Com CATV for the supply of 450 MHz distribution equipment. This equipment will be used to construct eight new systems in the Los Angeles area, totaling approximately 1500 plant miles. These systems are: Seal Beach, Gardena, Torrance, South Gate, Hawthorne, Lawndale, Santa Ana and El Monte, Calif. Features will include by-directional signal transmission and status monitoring.

Century III Has New Headquarters

BREA, Calif.—Although Century III's new headquarters here isn't filled to capacity, Vice President and General Manager Larry Fry is optimistic about its prospects for growth. Century III currently employs a staff of 160 in the shipping, testing, engineering and production departments; but, according to Fry, "We will be growing to an excess of 250 employees by year's end, so we'll be expanding in that building."

The new 60,000 square foot manufacturing facility is used primarily for the production and testing of the company's complete line of trunk and distribution equipment. Even though current space for these products far exceeds demand for them, Fry isn't worried. "We've doubled, even tripled our volume over the past four years."

Industry scuttlebut has it that Century III has been awarded an equipment contract, which covers trunk and distribution equipment valued in excess of $6 million, for the Denver franchise. Fry is unwilling to confirm or deny the rumor, saying only that, "We've talked to Mile Hi (Denver's operator)." But the look on his face and the feeling at the Century III facility all but confirm the fact that Century III is looking forward to a great deal of new business.

The manufacturing department itself is intensely human. There are no robots at this factory—only working men and women stuffing circuit boards with electronic components and testing both the modular components and the finished products.

The new facility houses complete design and testing laboratories for Century III's feed-forward technology. The company has installed two temperature testing chambers that simulate extreme weather conditions for testing components

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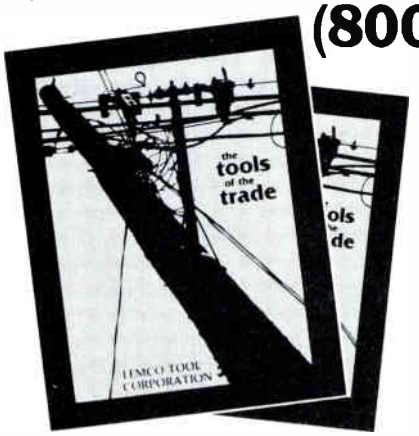

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at 20 degrees below zero and 140 degrees above. They also have added several new design testing stations to help with the development of new feed-forward technology. Soldering of components is done on an automated flow soldering machine that completely seals the plated-through holes of the circuit boards and then washes, dries and prepares them for testing.

Channel Master Introduces Two New Products

ANAHEIM Calif.—Channel Master Satellite Systems used its first appearance at a major cable show to unveil two new products—addressable traps and a wireless signal delivery system.

Address-A-Trap is a new patent-pending device that provides hard audio and video security through the use of a technique the company calls "picket fence jamming." This technique contains a "fence" of more than 40 jamming signals per channel. Because Address-A-Trap can be installed on a strand or pedestal outside the home, the device acts as a deterrent to signal piracy.

Channel Master is offering Address-A-Trap along with a completely programmable addressing system, known as the Subscriber Control System. In addition to Address-A-Trap, this system is comprised of an SCS computer (IBM personal computer) and data controller, which sends out addressing instructions to a maximum of 65,000 subscribers. The data controller also has the ability to preload 32 pay-per-view events.

Channel Master also announced its 52-channel wireless signal delivery system called Micro-beam. This delivery system can be used to beam CATV signals via CARS frequency over rugged terrain or non-franchised areas. The micro-beam has a single transmitter housing unit located behind the tower-mounted transmitting antenna, which Channel Master says will represent a cost advantage over other climate controlled installations.

For the most part, these new products were a result of Channel Master's own cable operator experience. Presently, the company owns nine systems in North Carolina, near two of its major facilities.

Anixter-Mark Develops AML Microwave Antenna

ANAHEIM, Calif. — Anixter-Mark announced at the Western Show that they have received approval on a microwave antenna developed for use in amplitude-modulated-link (AML) systems for the CATV industry.

According to a company spokesman, only Andrew Corp. microwave antennas were previously approved for use in AML systems, but Anixter-Mark now will be able to supply the total antenna requirements for customers using an AML system.

The package includes standard, dual-polarized, high-performance and maximum high-performance CARS band antennas in sizes ranging from 4-12 feet in diameter, and circular waveguide, elliptical waveguide and accessories.

Gill Management To Develop Software For S-A AMS

ANAHEIM, Calif.—Scientific-Atlanta announced, on the opening day of the Western Show, that Gill Management Services will develop a complete software package for use in S-A's new Addressable Management System (AMS). According to S-A, AMS is a comprehensive approach to CATV system addressability that utilizes S-A's series 8500 set-top terminals and software functions for subscriber and pay-per-view management, addressable control and set-top terminal inventory management.

The AMS features integrated device control/subscriber information software and uses pre-formatted CRT display screens to simplify the entry of information. The AMS is designed to stand alone or it may be interfaced with the CATV operator's existing billing system.

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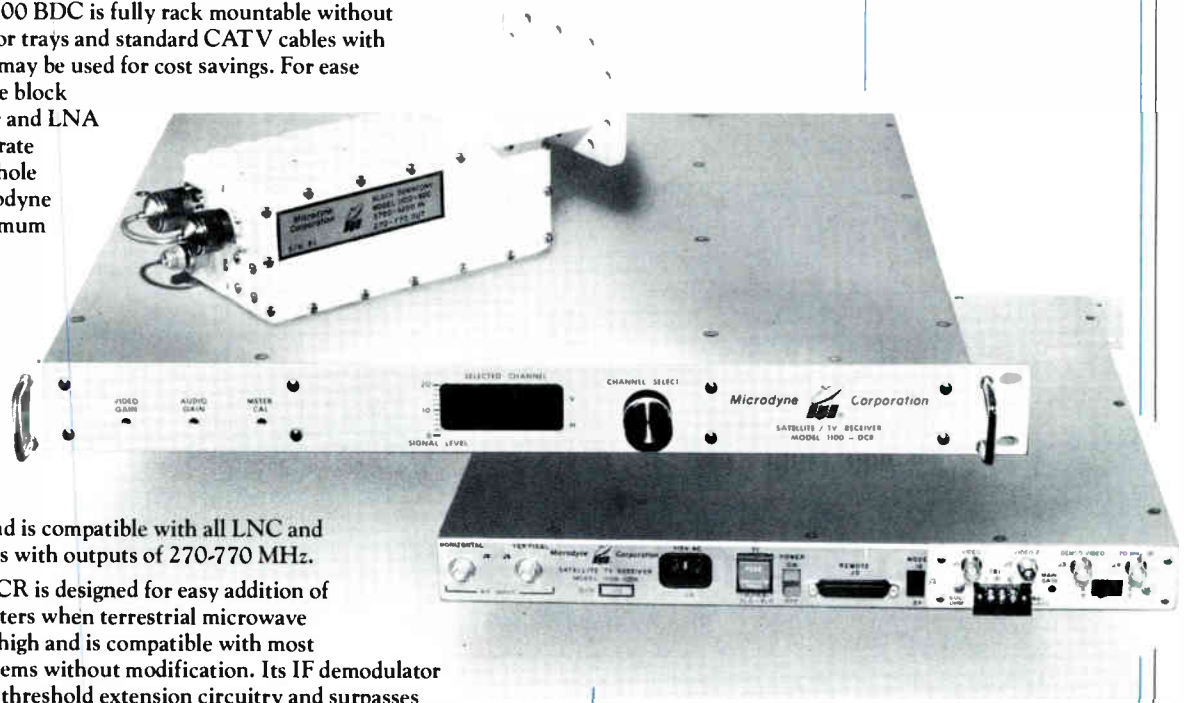
Microdyne's 1100 BDC is fully rack mountable without extra brackets or trays and standard CATV cables with F-type fittings may be used for cost savings. For ease of servicing, the block downconverter and LNA are in two separate chassis. The whole system is Microdyne tested for maximum performance and is compatible with all LNC and downconverters with outputs of 270-770 MHz.



Microdyne's DCR is designed for easy addition of internal trap filters when terrestrial microwave interference is high and is compatible with most scrambling systems without modification. Its IF demodulator offers patented threshold extension circuitry and surpasses industry standard for threshold and video performance.

At a time when cutting costs is so important, look to Microdyne for innovative, cost-effective systems.

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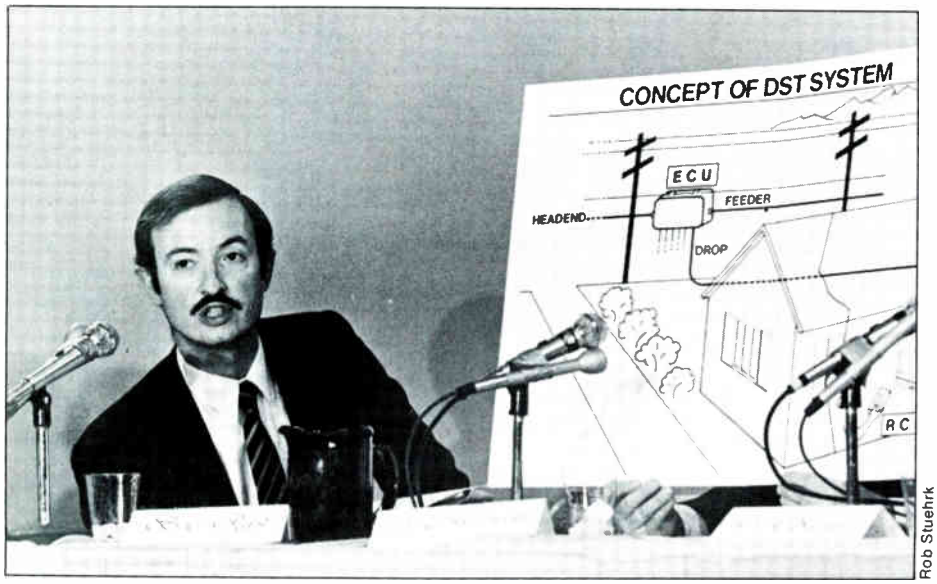

Rob Stuehrk

Bob Rast, ATC vice president of research and development, describes the concept behind the DST system at a recent press conference in which ATC's joint venture with Toshiba was announced.

ATC And Toshiba To Develop DST System

DENVER—American Television and Communications Corp. (ATC) and Toshiba Corp. announced an agreement here last week to develop and produce multi-service, outside-the-home cable electronics hardware. The Distributed Subscriber Terminal System (DST) was conceptualized by ATC but will be designed, developed and manufactured by Toshiba.

According to Michael McCrudden, executive vice president of corporate development for ATC, ATC's Request for Proposal for the DST sytsem was offered to all major domestic cable and consumer electronic manufacturers and to major Japanese consumer electronics manufacturers as well. Shoichi Saba, president of Toshiba, explained that the DST represents "one of the seven strategic areas of focus for Toshiba, which includes video and audio technologies, such as CATV." Through this collaborative venture, Saba said, Toshiba hopes to hone its media capabilities and to extend its relationship with ATC into other high growth areas in the future.

The home-end unit of the DST, expected to be available to the cable industry within 18 months, will differ from most other addressable systems by placing a substantial portion of the electronics, the external control unit (ECU), outside the home. According to ATC officials, this distinction will enable cable operators to exert more control over increasingly sophisticated and expensive equipment and will reduce the potential for hardware and programming theft.

The DST will be designed not only to be capable of providing pay-per-view and addressability but of supporting future services, including: security, energy management, audio services and subscriber polling. By replacing the traditional cable system tap for hardware sharing with the ECU, the DST can be retrofitted into existing cable systems. The ECU can be either strand-mounted, pedestal-mounted or wall-mounted and can isolate the drop cable and drop cable connectors from the return on the feeder cable. As a result, ATC officials contend, the DST will improve the cable system's integrity for return band communications.

Scheduled to be manufactured at Fukaya Works, a fully automated Toshiba consumer electronics manufacturing facility, the DST system will be tested and then offered to the entire cable industry early in 1984.

Two- And Three-Beam Feeds Gaining Practical Application

LOS ANGELES—Three of the most popular manufacturers of earth stations now have dual-beam feed modification kits ready for their customers. Microdyne Corp., M/A-COM Video Satellite and Scientific-Atlanta have finalized the development of hardware that will allow cable operators to receive transmissions from two satellites using only one earth station.

The technology that makes this possible has been developed by Hughes Communications. The non-proprietary

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

system utilizes dual feed-horns in a dish antenna that is placed off-focus of both satellites. The signals from the satellites are received simultaneously. The separation between the two signals allows for reception of signals of the same frequency and polarization, while maintaining an adequate amount of isolation.

Although Hughes developed the "dual-beam feed modification" over ten years ago, its application was limited because of the lack of communications satellites spaced sufficiently close to one another. In tests conducted by Hughes in July, signal loss for two satellites spaced 4 degrees apart was found to be approximately one-half dB, an amount that is imperceptible to the human eye. In similar tests conducted by Scientific-Atlanta, a signal loss of less than one-half dB, was realized.

As a result of the proposed June 1983 launch of Hughes' Galaxy 1 satellite, the modification already has gained practical significance for the cable industry. Dedicated solely to cable programming and spaced 4 degrees from Satcom 3-R, Galaxy 1 will carry transmission from Time Inc., Group W, Times Mirror Satellite, Viacom, Turner, SIN and C-SPAN. Satcom 3-R customers include Time Inc., Warner Amex, Times Mirror, Viacom, Turner, SSS, PTL, ESPN, CBN, USA, MSN, C-SPAN, and Landmark Communications, among others.

According to Hughes Communications' Norman Weinhouse, the four-degree spacing between the two satellites makes a dual-beam feed assembly ideal for simultaneous reception. Satellites spaced as far apart as 8 degrees have been tested with the dual beam modification, and signal loss was on the order of one dB. Even that amount "seems not to be perceptible," Weinhouse said.

Of the three manufacturers, only Microdyne has actually delivered modification kits. Scientific-Atlanta will have three or four kits available by the end of December, with full-scale manufacturing expected to begin in January. MSOs have already ordered several kits, a Scientific-Atlanta official reported.

In addition to the availability of a dual beam feed modification, M/A-COM is also offering a three-beam capable earth station. The new technology is being demonstrated at this year's Western show, with the test receiver aimed at Satcom I (135 degrees), Satcom 3R (131 degrees) and Comstar D4 (127 degrees).

Scientific-Atlanta has decided against offering a three-beam modification. The company doubts that it can bring the transmissions within FCC specifications, a Scientific-Atlanta spokesman revealed.

Modification kits for existing antennas will cost in the range of $2,000, excluding installation. Retrofit can be accomplished by the cable operator in about one hour.

Scientific-Atlanta will also make the modification available to purchasers of its 4.605m antenna, as a $1,000 extra-cost option.

First Call For NCTA '83 Technical Papers

WASHINGTON—The NCTA Office of Science and Technology has issued a first call for technical papers to be presented at the 32nd annual NCTA convention, June 12-15, 1983 in Houston, Texas. Although the technical program will follow the same format as in recent years, the NCTA is now warning prospective authors of technical papers to "assiduously avoid a salespitch in their descriptive treatment of a product, systems or company." According to a release from the NCTA Office of Science and Technology, the NCTA recognizes the technical paper series and convention sessions as engineering forums, not as "means of advertisement."

As part of the NCTA annual convention, the technical program will consist of 20-minute oral presentations on communications engineering topics pertinent to the cable television community. In the past, topics have included: videotex/teletext, satellites, protection of service/privacy, grounding techniques, fiber optics, addressability, data transmission, and the like. Anyone interested in preparing a paper for the program should submit a one-page, 150-word abstract to the NCTA no later than Jan. 14, 1983. Authors of those abstracts selected by the technical convention subcommittee will be notified by Feb. 18, 1983 and will be asked to submit their respective, completed papers by March 28, 1983.

Despite the 20-minute limitation for oral presentations, all papers requested by the subcommittee, both full-length and overview, will be included in the anticipated publication, *1983 Technical Papers*.

To supplement the oral presentation of these papers, the NCTA will make slide and transparency projectors available and will arrange for other audio-visual aids on special request.

Abstracts should be submitted to: Wendell Bailey, VP-Science & Technology, National Cable Television Association, 1724 Massachusetts Avenue, NW, Washington, D.C. 20036, (202) 775-3637.

CBS Completes Test Of HDTV In San Francisco

NEW YORK—The United States could soon take the lead in television technology—an area in which it rates below other nations of the world—if the American television industry decides to make a commitment to high definition television (HDTV).

A three month test by CBS has proven the technical feasibility of HDTV. CBS, which has been involved in a cross country campaign for the last six months to promote the technology, says that its experiment with the Japanese system has been a success.

According to a CBS executive, the test showed the feasibility of terrestrial transmission using 12 GHz frequencies. By means of randomly selected receive sites in the San Francisco Bay area, CBS transmitted at 10-watts over a broadcast HDTV tower, with frequencies in the 12.3 to 12.7 GHz range.

But, despite its sponsorship of the Japanese-developed format, CBS claims it is not devoted to that particular technology. "NHK (the Japanese Television Network) has trailblazed this whole area, but we have not adopted it as our own," said a CBS spokesman. Be that as it may, CBS executives are confident that within the next year, the television industry will hone its technological approaches to HDTV technology.

The Japanese version, developed by NHK in conjunction with Sony, Ikegami and Panasonic, is a system that would use more than twice as many scanning lines as American television to produce each picture frame. Instead of 525 lines per frame, the Japanese concept calls for 1,125. The greater number of scanning lines requires an increase in the fre-

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quency bandwith needed to carry the signal. Unlike the 6 MHz bandwidth required to carry a normal signal, HDTV needs about 30 MHz per channel.

That could be a drawback for cable operators in that five normal channels would be needed to carry one HDTV signal.

HBO Upgrading Studio Production Facilities

NEW YORK—Home Box Office is completing work on two new state-of-the-art technical facilities—an editing room and a film-to-tape transfer room—at its downtown Manhattan production studios. Officials estimate the cost of the technical upgrade at $2 million.

According to Ralph Fumante, director of technical services, the editing facility is being equipped with five 1-inch Ampex videotape units, a Grass Valley Group 300B console with built-in computerized special effects; two, four-track stereo audio recorders; a two-track audio recorder; and an Eve stereo audio console.

The film-to-tape room features a Rank Centel film chain-to-video unit with pan and scan, zoom, compress and stretch capabilities. Both suites are being equipped with dual-channel Chyron 4 units.

The facilities will be utilized for production and post-production chores for HBO, Cinemax, USA Network, and possibly for outside clients, Fumante said.

HBO Studio Productions, as the facility is formally titled, is constantly upgrading its technical gear, but has never before housed film-to-tape transfer equipment. To date, transfers have been done in Los Angeles.

"We believe some of the great success of HBO is due to the superior technical quality that we deliver," Fumante said.

Opposition To Interim DBS Strong In California

WASHINGTON—In California, there is some strong opposition to the direct broadcast satellite plans endorsed by the Federal Communications Commission.

The California Public-Safety Radio Association has joined others in the appeal of the FCC's DBS interim rules. The appeal was filed by the National Association of Broadcasters in the U.S. Court of Appeals, D.C. Circuit. In addition, the Los Angeles County Sheriffs Department has filed a petition for reconsideration of the FCC's rules and is expected to join the NAB's lawsuit if the petition is rejected.

These California organizations have a common beef with DBS. They say the spectrum space allocated for DBS (12.2-12.7 GHz) will cause problems for public and private radio systems.

The Los Angeles County Sheriffs Department argues that the use of the 12 GHz band for DBS would render its $12 million terrestrial microwave radio system obsolete. According to Sergeant Randall Watwood of the Communications and Fleet Management Bureau, the department would have to rebuild its vast microwave-radio system if it cannot use the 12 GHz band. The Los Angeles County system links 18 sheriffs' stations in an area of more than 4,000 square miles, some of which is rugged terrain. Reconstructing the system would be difficult and costly, Watwood said.

Watwood claims "The commission indicated that DBS will not interfere with us. But they foreclosed the 12 GHz band. They reallocated it right out from under us

Watwood claims "The commission indicated that DBS will not interfere with us. But they foreclosed the 12 GHz band. They reallocated it right out from under us and didn't tell us where we're going."

The Los Angeles county commissions network has "some major microwave hops," crossing as much as 27 miles, Watwood said. If the county is forced to use a different band, distance between the hops may have to be reduced to as little as 5 miles. That would increase both the number of microwave units and the cost of the system. He added that the installation of microwave units in the mountainous portions of the county would be difficult.

The California Public-Safety Radio Association intervened in the NAB appeal because it foresees problems with many local government radio networks and with private users of terrestrial microwave. A representative of the association said many companies, such as railroads and oil companies, may be forced to surrender their use of the 12 GHz band to private radio systems. Richard Miller, the president of the association, has spoken out against the FCC's interim rules for DBS but was unavailable for comment at press time.

Use of the 12.2-12.7 GHz band for DBS is contingent upon agreement at the 1983 Regional Administrative Radio Conference, to be held this summer. In the meantime, the FCC has authorized eight DBS applications. It approved construction permits for CBS (on the condition that CBS submits financial data), Direct Broadcast Satellite Co., Graphic Scanning Corp., RCA Americom, Hubbard Broadcasting's United States Satellite Broadcasting Co., Comsat's Satellite Television Corp., Video Satellite Systems and Western Union.

NAB filed two suits, one after the FCC released its interim rules and one after the commission authorized the STC system. Valerie Schulte, an NAB counsel, said the association would not file any suits relating to the other DBS application grants because most of the issues would be addressed by the two suits already filed. NAB primarily is upset that the use of the 12.2-12.7 GHz band may preclude spectrum space for high-definition television. "They abdicated their spectrum management role," Schulte said of the commission. "We couldn't use the same band to rebroadcast terrestrial high-definition television if they gave it to DBS."

The NAB appeal also has been supported by the National Citizens Committee for Broadcasting (recently renamed the Telecommunications Research and Action Center) and Forward Communications and by nine other broadcast television station owners. The National Christian Network has filed a separate action with the appeals court, claiming that its own DBS application was rejected unfairly by the FCC.

Bell Labs To Introduce Time-Frequency Multiplexing

NEW YORK—Bell Laboratories researchers say they have perfected a method of transmitting two television signals over one satellite transponder. Known as time-frequency multiplexing, this process will be introduced to technical communications executives at the Institute of Electrical and Electronics Engineers GLOBECOM conference in Miami Beach.

Using this process, Bell Labs scientists contend, two different television signals can be sent out over one transponder without distorting the viewer's picture quality. The process allows each signal to be transmitted over a different frequency bandwidth. Signal one is delivered over a normal TV frequency (between zero and 4.2 MHz). The second signal, with a smaller differential, is by a double-sideband suppressed carrier modulation, through a higher frequency band. The speed of each signal is accelerated so both signals can be transmitted in half the time it takes a one picture/one transponder system.

Once both signals reach the transponder, they are relayed to a ground receiving station. At this point, a separate signal processing system breaks the frequencies down into two separate pictures which can be processed for normal transmission to homes.

Bell Labs has been testing the process over the past year on its Comstar D-1 and D-2 satellites. Barry Haskell, head of the division's work in radio communications research, supervised the tests with staff member Robert Schmidt; both men have worked on time-frequency multiplexing for the last few years.

According to Haskell, testing of the process, which began last spring, was initiated for several reasons: first, as a response to other companies' interest in the two signal/one transponder concept,

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and secondly, as a result of increasing concern over the availablilty of orbital positions for satellites in the future. "The slots are disappearing at a great rate. So we decided to carry the development process further than it might normally go," Haskell said.

In the testing stage, Haskell and Schmidt asked fellow Bell Labs staff members to look at transmissions using the process in a special room. Three types of material were transmitted to and from the Comstar satellites: electronic color bar generators (in order to judge signal-to-noise rtio on transmissions), actual television signals taken off the air and individual videotaped programs.

During each test, officials were asked to view one picture/one transponder and two pictures/one transponder transmissions intermittently. When a two-signal transmission occured, officials were asked to switch from one picture to the other (using a remote control device attached to monitors) and to note any change in picture quality.

"It's an extremely conservative, subjective test," Haskell said. "On a normal picture, without using multiplexing, you would see one picture overlap on top of another. The time frequency splits them apart. That way, the two signals never interfere, and there is no change in picture quality."

Bell Labs officials say the signal-to-noise ratio, using time-frequency multiplexing, is 53 to 55 decibles using a 10-meter earth station. The figure is equal to or two degrees higher than the terrestrial broadcast standard of 53 decibles. The audio part of both signals is transmitted during horizontal blanking time, after digitalization and special arrangement for time-divsion multiplexing—a separate procedure.

Haskell acknowledged that while Bell Labs will describe the method at GLOBECOM, lack of facilities will prevent its actual demonstration. "There's no earth station suitable there. It was not convenient."

If brought into the marketplace, the device could reduce the number of cable programmers waiting on the sidelines for satellite time. But at this point, Bell Labs is not ready to say, or even speculate, when the process could be utilized by AT&T's Comstar or upcoming Telestar satellites or by other satellite companies.

"Satellite costs are the overriding factor," Haskell claimed. "A lot of that depends on the equipment. Ground station expense may not be that important. It all depends on how much of a development effort there is in the process." The further development issue he continued, is in the hands of AT&T's Long Lines division, which is now studying the matter.

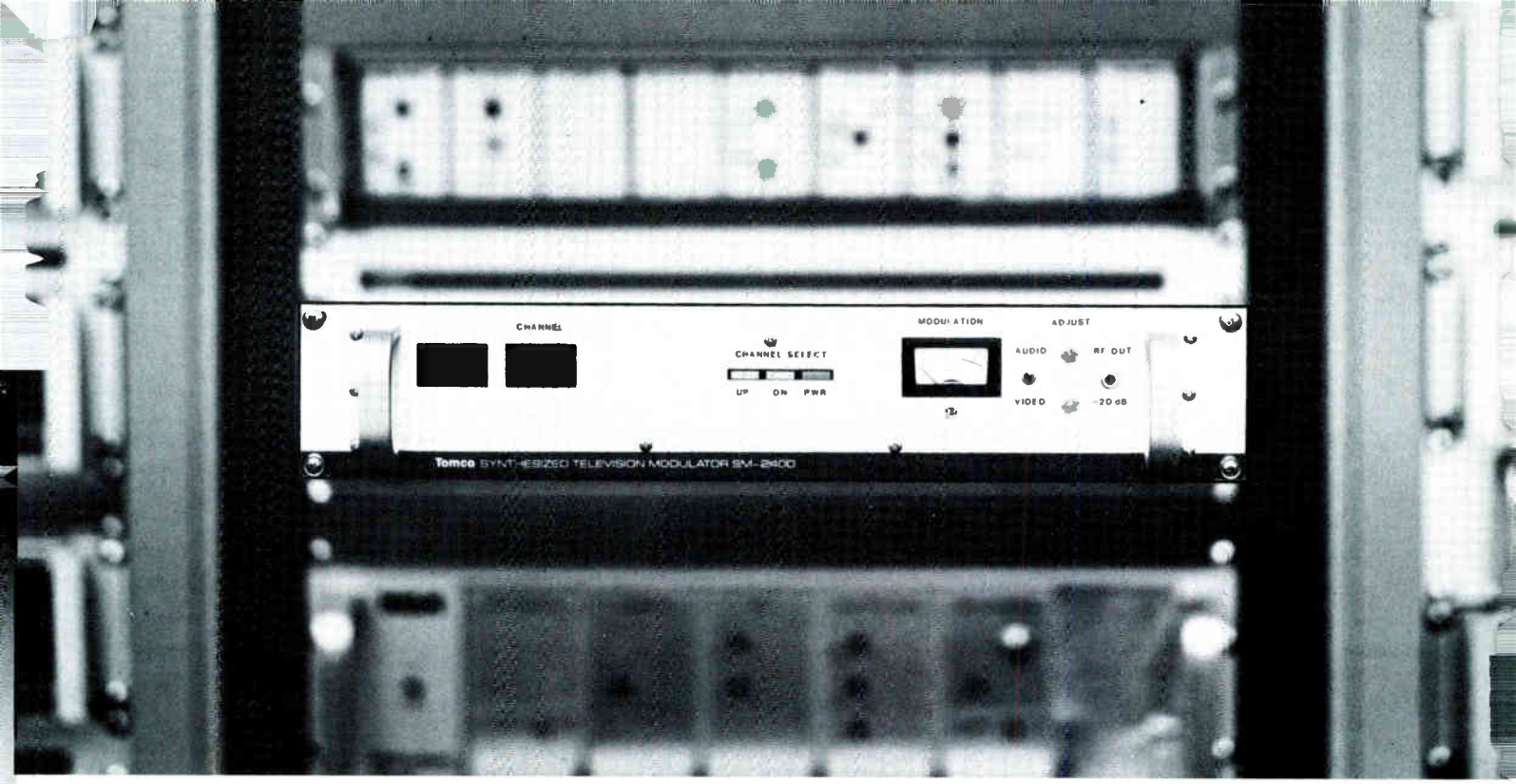
RCA Wins $100 Million Contract

PRINCETON, N.J.—RCA Astro-Electronics announced that it has won a contract in excess of $100 million to design and build two direct broadcast satellites (DBS) for Stellite Television Corp. (STC), a wholly owned subsidiary of COMSTAT (Communications Satellite Corp.)

STC's initial DBS service will use two satellites to reach an area approximating the Eastern time zone of the United States. STC will offer three channels of pay television beamed directly from the satellites-which will be several times more powerful than conventional commercial satellites-to individual homes equipped with 2- to 2½-foot receiving antennas.

"A new type of telecommunications satellite system, DBS significantly expands RCA's satellite communications based and further strengthens RCA's position in the telecommunications industry," said Charles Schmidt, division vice president and general manager at RCA Astro-Electronics.

According to STC, the DBS satellites will include space-proven technology for high reliability and will be launched by either the space shuttle or the Ariane rocket. Already STC has scheduled launches for 1986.



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Comband Responding To The Demand For Increased Channel Capacity

Comband: A Real Time 2:1 Video Bandwidth Compression System

By the Corporate Research and Development staff, General Electric Co.

An on-going objective of communications systems research has been to increase the amount of signal information handled by a given communications channel. Complex signal processing systems have been devised that reduce the data needed to describe still or slowly moving pictures. For instance, video frame buffers have been developed that take advantage of frame-to-frame redundancy to compress information.

Most systems today are relatively expensive to implement and often are not designed to work in real-time. Expense has never been a prime concern because, to date, applications of bandwidth compression signal processing have not been consumer-oriented. Likewise, real-time transmission and reception were not considered essential, for instance, in relaying pictures from outer space probes.

In response to the universal demand for greater channel capacity and for consumer-oriented applications of bandwidth compression, General Electric engineers have developed a system that realizes bandwidth compression (BWC) of video images in real time. This system utilizes circuit components and techniques not available when the NTSC TV standards were established in 1953.

BWC Techniques

Comband uses visual perception properties, line-to-line correlation in images and increased transmission efficiency to achieve bandwidth compression. Specifically, a reduction in the vertical resolution of the color signal is used to yield a 10 percent reduction in bandwidth. Line-to-line redundancy is used to yield an additional 15 percent reduction in bandwidth. Finally, improved transmission efficiency yields a further bandwidth reduction of between 25 and 30 percent over the NTSC system. Combined, these techniques can result in bandwidth compressions of 50 percent or more.

An important goal of General Electric's BWC work was the development of a system of sufficiently low cost to allow individual decoders to be installed in the home of each customer. For this reason, expensive components such as frame buffers and techniques requiring large quantities of advanced video processing were not considered. The Comband system relies solely on digital or analog line buffer memories, the type currently used in comb filter television receivers.

Color Bandwidth Reduction

The spectrum allocation given in the NTSC system takes advantage of the fact that the human eye has a lower spatial frequency response to chrominance signals than to the luminance signal. Without the use of comb filters, the NTSC system provides 3.0 MHz of luminance bandwidth but only 0.6 MHz for each of the in-phase and quadrature-phase chrominance signals I and Q. It is significant to note that the decrease in color bandwidth relative to the luminance signals is implemented in the NTSC system only in the horizontal direction. Thus, in the NTSC system, each line in an image field presents completely new color information at the same high rate that luminance changes are presented. This obviously wastes bandwidth since the eye cannot resolve such closely spaced color differences in the vertical direction.

In the new system, the color signals on two adjacent lines in a field are averaged, and this average signal is displayed without change on each of the two lines. In a 500-line picture, for example, only 250 lines of color information are transmitted. The same technique, utilizing a rolling average, is used to separate and display the luminance and chrominance signals in "Super Sets" employing comb filters for increased resolution within the NTSC system.

The elimination of new color information from half of the transmitted lines leads to an effective bandwidth saving of 0.6 MHz, which represents 10 percent bandwidth compression of a 6 MHz standard TV channel. The technique of halving the color information by this means has been investigated by computer simulation using still images. To the unaided eye, no

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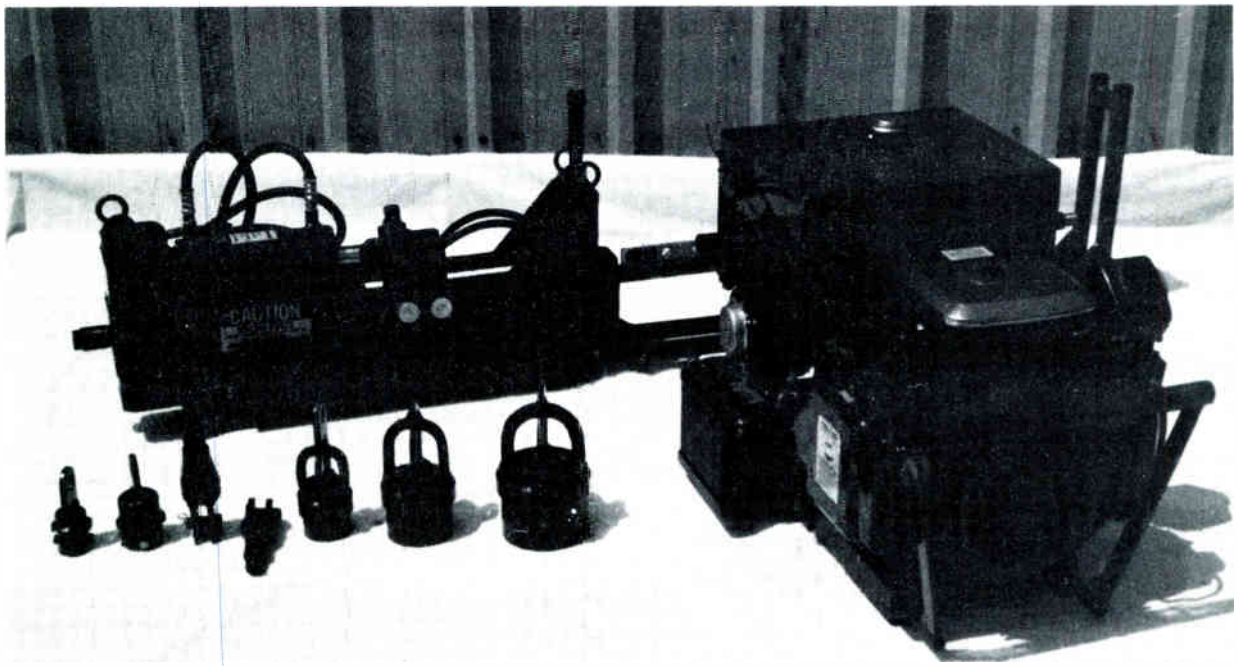

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picture degradation results from using this technique. A magnification of 4X is required before any objectionable artifacts are noted.

Line-To-Line Redundancy

The second method for compressing picture bandwidth involves reducing the transmission of vertically redundant luminance information. Two adjacent lines A and B can be treated as a line pair and processed into two signals: their sum (A + B) and their difference (A - B). The difference signal is commonly referred to as the vertical detail signal.

The vertical detail signal requires less bandwidth than the signal of either line alone. Comb filter television sets utilize this restricted bandwidth characteristic to obtain the full NTSC luminance bandwidth of 4.2 MHz in the following way. The sign of the chrominance is inverted from line to line: the luminance has the same sign from line to line. Comb filter circuits utilize a single line delay so that both lines A and B are available for processing simultaneously. If the two lines are summed, most of the chrominance information is cancelled, leaving a luminance signal with a bandwidth of 4.2 MHz. The two signals are also subtracted to form the (A - B) signal. Since the sign of the chrominance signal changes from line to line, this results in an addition of the two color signal components.

Figure 1 *Bandwidth compressed image with line pair difference signal limited to 0.318 MHz bandwidth*

The upper frequency components of the difference signal represent the chrominance information, while the lower frequency components represent the vertical detail component of the luminance. Experimental measurements indicate that there is little information in the vertical detail signal above 1.2 MHz, thus acceptable picture quality is obtained when this signal is limited to 1.2 MHz.

The images shown in figures 1, 2 and 3 illustrate the effect of limiting (A - B) bandwidth in a computer simulation study. If only 0.318 MHz is used for (A - B), the image is surprisingly well represented, as shown in figure 1. Closer examination, however, shows unacceptable step-like artifacts on diagonal lines such as roof and bush edges, as well as on door posts and edges. If the (A - B) bandwidth is increased to 1.0 MHz, most of the objectionable step-like artifacts disappear, as shown in figure 2. If this bandwidth is doubled to 2.048 MHz, the improvement in picture quality is almost imperceptible, as shown in figure 3. In pictures with motion, these artifacts are even less objectionable because the eye has less time to study them.

Computer simulation studies such as those shown in figures 1-3 and experience with comb filter "Super Sets" supports the idea that line-to-line redundancy of luminance can be used to reduce bandwidth without objectionable picture degradation.

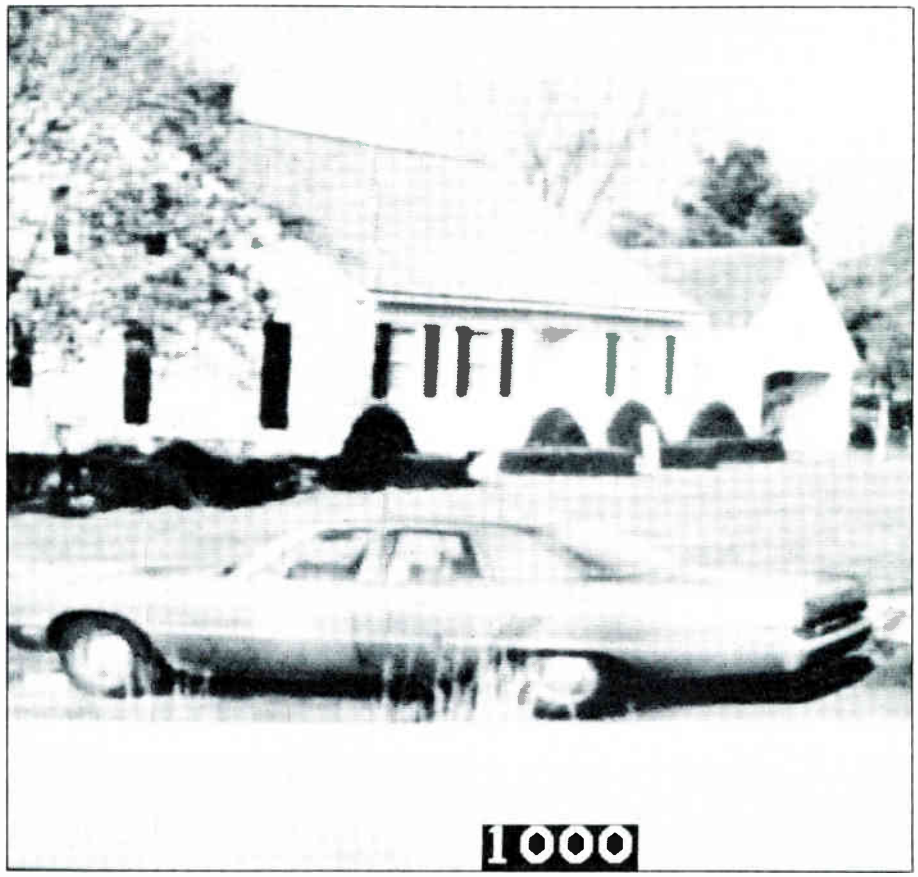

Figure 2 *Bandwidth compressed image with line pair difference signal limited to 1.000 MHz bandwidth*

Signal Processing

The NTSC standard has been in use for 30 years, however, it is only with the recent advent of comb filter technology that full quality NTSC imagery has become possible. Even with this extension of the art, a significant amount of the NTSC spectrum is not fully utilized. The horizontal scan time is 63.5 microseconds; of that time, approximately 11 microseconds is used for the horizontal retrace time. This length of retrace time was chosen primarily to allow sufficient time for the electron beam to travel from one side of the picture to the other. The horizontal retrace time is also used in NTSC for synchronization and color burst signals; however, these functions could be performed in much less time by using modern time compression and expansion techniques. It is possible to drop 6.35 microseconds from the horizontal retrace time and still leave 4.65 microseconds for synchronization functions. This would correspond to a 10 percent improvement in signal bandwidth.

A second opportunity for improving transmission efficiency is to utilize the 1.25 MHz vestigial sideband area below the main carrier more effectively. The first 1.25 MHz of the luminance signal is sent with double sideband modulation; it is not used to transmit unique information. By

Figure 3 *Bandwidth compressed image with line pair difference signal limited to 2.048 MHz bandwidth*

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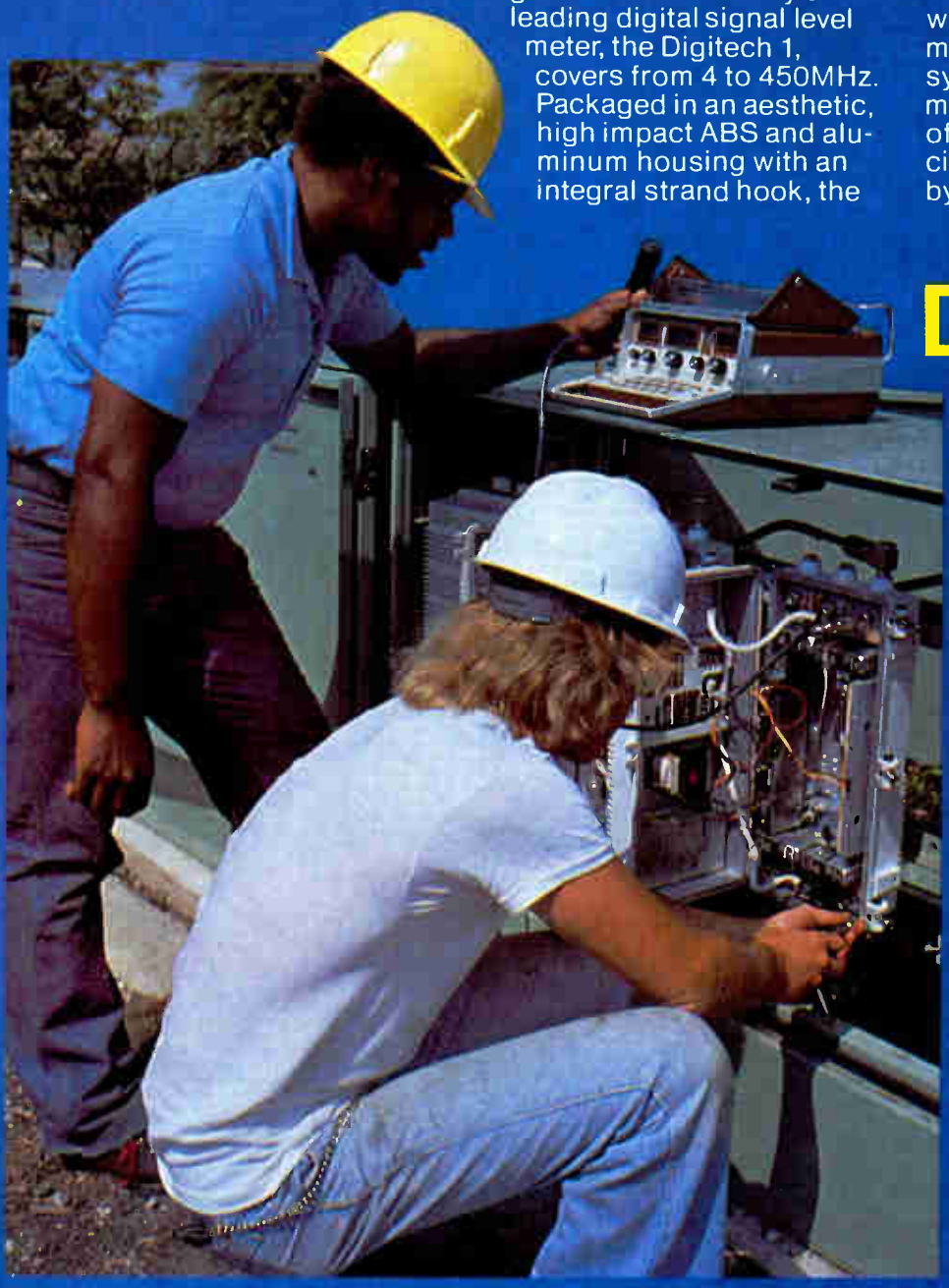

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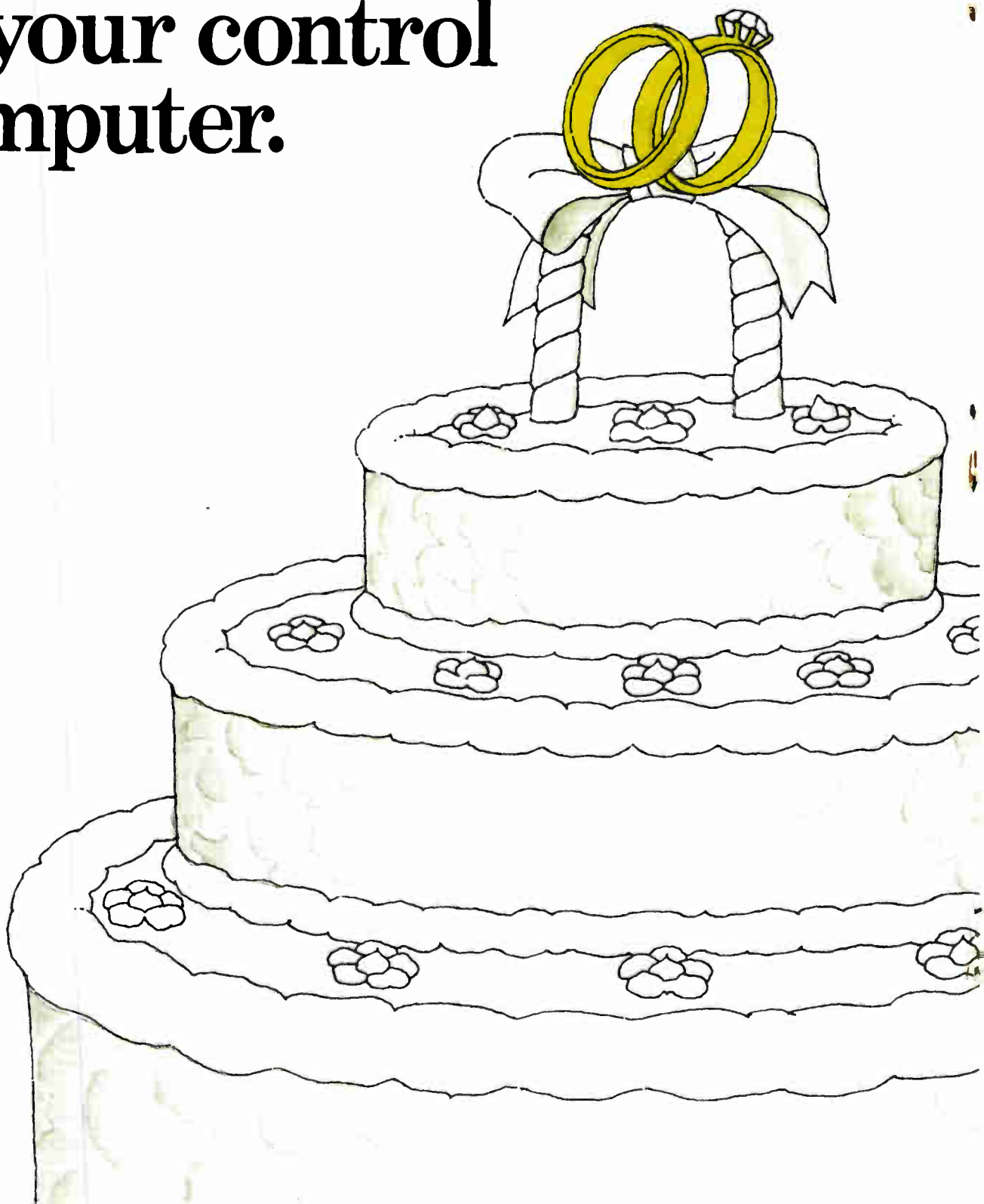

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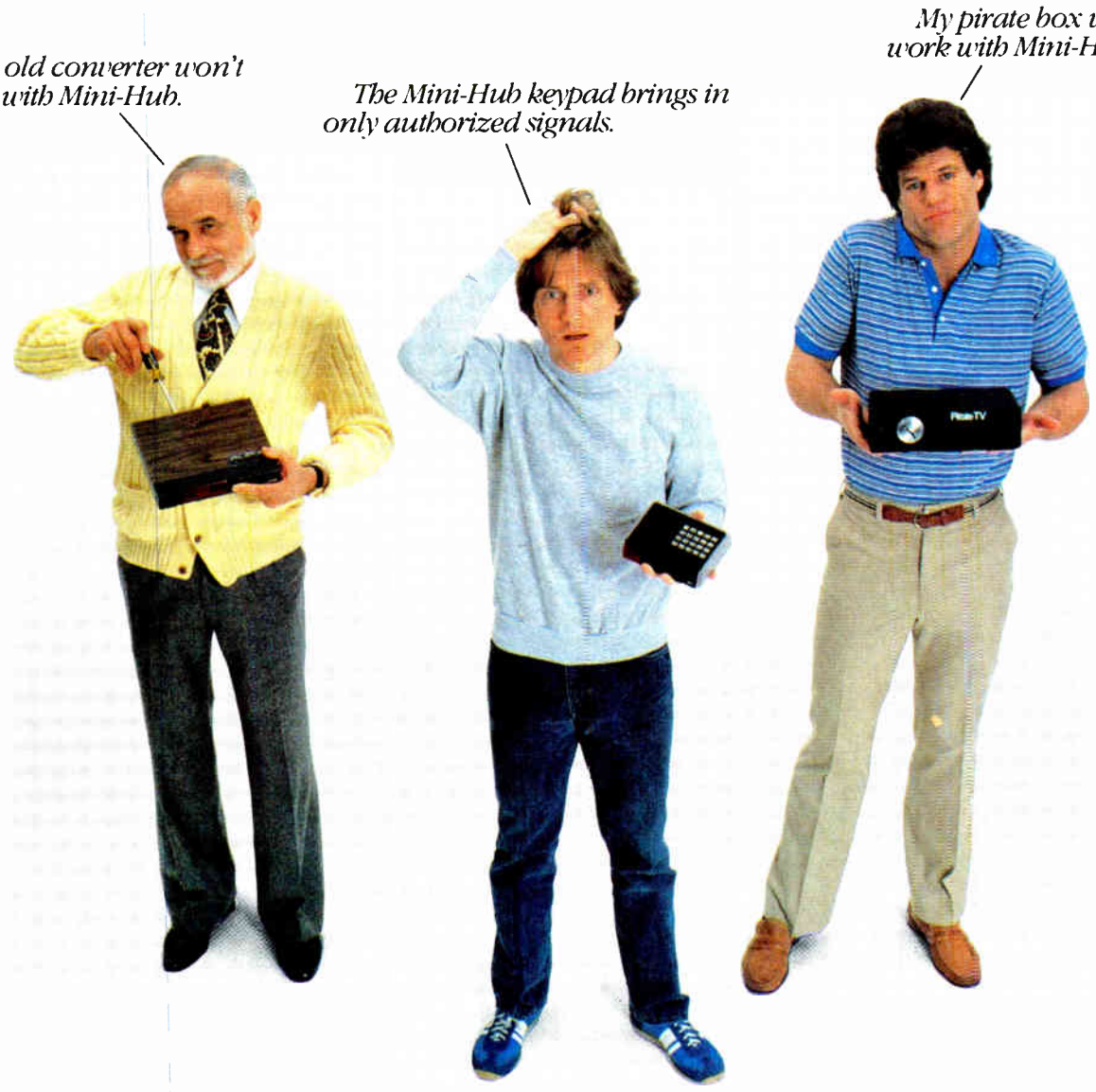

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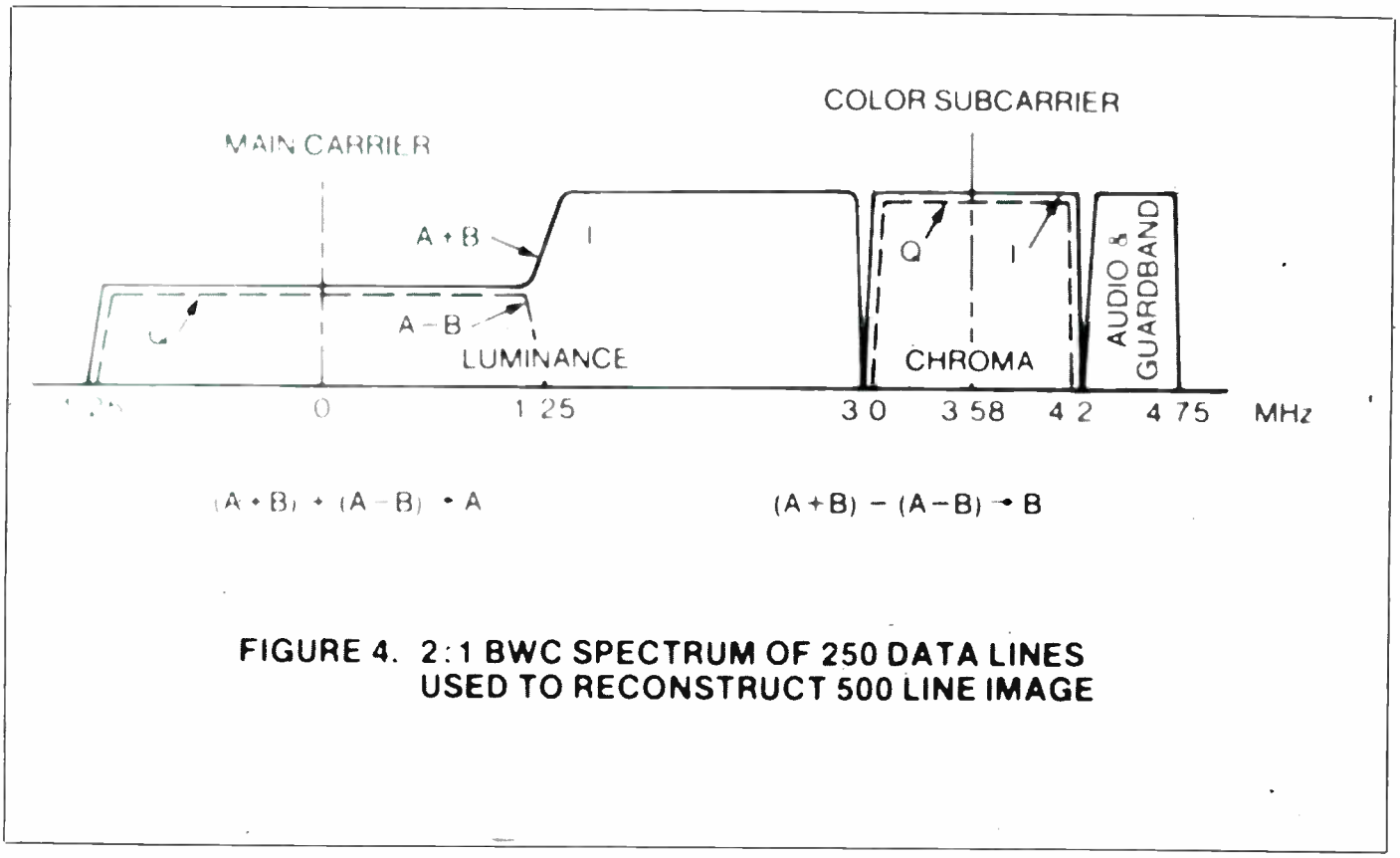

FIGURE 4. 2:1 BWC SPECTRUM OF 250 DATA LINES USED TO RECONSTRUCT 500 LINE IMAGE

Figure 4 2:1 Bandwidth compressed spectrum of 250 data lines used to reconstruct 500-line image

sending a secondary signal quadrature-modulater on the main carrier, the 1.25 MHz lower sideband area can be used to transmit useful information. Effective use of this area would represent an effective bandwidth compression of 20 percent of the normal 6 MHz spectrum allocation.

2:1 Bandwidth Compression System

The three bandwidth compression techniques described above can be combined to provide an overall compression ratio of 2:1, as shown in figure 4. Repeating the color signal allows two lines of color to be displayed for each line sent. The vertical detail signal, which contains the difference between two adjacent lines in a field, can be limited to 1.2 MHz; and this signal can be quadrature-modulated on the main carrier, occupying the lower vestigial sideband area currently being wasted. So, using only a single line of storage, two complete and slightly different lines of video can be reconstructed for each single line transmitted. A completely analog approach can be designed to do these functions using 910 element CCD delay lines.

Applications

A number of applications can be visualized that will benefit from low-cost bandwidth compression, such as CATV, subscription TV, AML links, satellite utilization, and videodisk/tape systems. The basic concept is common to all applications; however, the modulation scheme will vary widely with the application.

CATV Systems

The first product under development utilizing low cost bandwidth compression technology is a coding/decoding system to allow the capacity of current CATV systems to be increased. There is a strong push to offer CATV systems with channel capacity well in excess of the common 30-channel system. Up to now, the only options available to cable operators who needed to upgrade was to replace the cable with a higher bandwidth cable, including improved distribution amplifiers, or to install a completely new, second cable. This represents a very large investment of capital since cost is based on the number of homes passed, not on the number of subscribers who will pay for the extra, premium services that are transmitted on the additional channels. As such, the economics favor a bandwidth compression system that can be installed incrementally for only those customers who pay for the extra services.

Implementation of the CATV bandwidth compression system requires that two video channels be interlaced on a line-by-line basis. Since two lines of an image can be reconstructed from each single line transmitted, a full horizontal line time is available for transmission of a second signal while the second line of the first signal is being displayed. The two channels are held in frame synchronization with most of the vertical blanking period available for standard teletext information. Since two pictures are being transmitted, individual audio signals corresponding to both images need to be sent.

Satellite TV And Other Broadcast Links

Current satellites have transponders for 24 channels, and channel space is at a premium for most of those satellites. Bandwidth compression raises these capacities to 48 channels, can be applied to various transmission links, including subscription TV and AML links and halves the cost of large AML links.

Summary

This article describes a method whereby excess vertical color information, redundant vertical luminance information and unused portions of the NTSC time and/or frequency spectrum are combined to yield low cost real-time 2:1 video bandwidth compression. Information is processed on a line-by-line basis, eliminating the need and expense of frame buffer storage. Many applications ranging from increased channel capacity on satellites or CATV cables to increased playing time on video recorders can benefit from the new compression technique. CED

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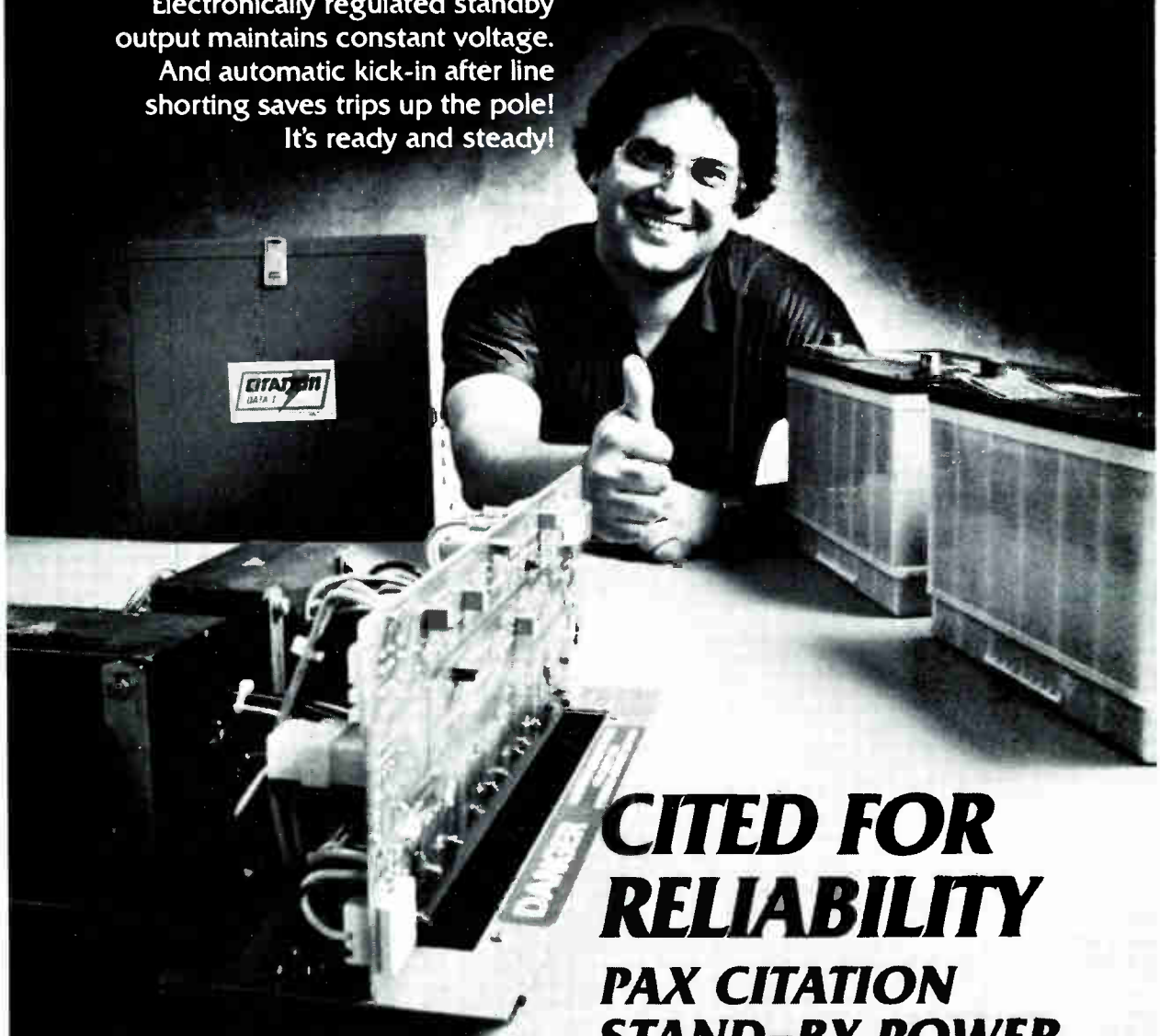

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No Loose Ends Part IV

Techniques For Tests And Measurements Using The Spectrum Analyzer

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

This is the conclusion of the *No Loose Ends* series. The first three installments appeared in the June, August and October issues of **CED** respectively. The series was presented as an upgraded version of the widely-used original *No Loose Ends*, published by Textronix in 1973 and written by Clifford Schrock. This fourth and final part deals with low frequency disturbance and hum measurement, terminal isolation measurements and leakage measurements.

10. Low Frequency Disturbance And Hum Measurement Capability

Low frequency disturbance and hum is defined as the peak-to-peak variation of the sync tip amplitude over the period of one frame (from one vertical interval to the next). These conditions can be caused by power supply hum, poor clamping or DC restoration circuits. The spectrum analyzer is used in its Zero Span mode as a receiver. LF disturbance and hum as small as 2 percent can be measured with this procedure.

Equipment Required

1. Spectrum Analyzer: Tek 7L12 or 7L14.
2. Mainframe: Tek 7613 or any 7000 Series mainframe.
3. Minimum Loss Pad: Tek 011-0112-00 or 011-0118-00 or equivalent. (May be omitted for added sensitivity without loss of measurement accuracy.)

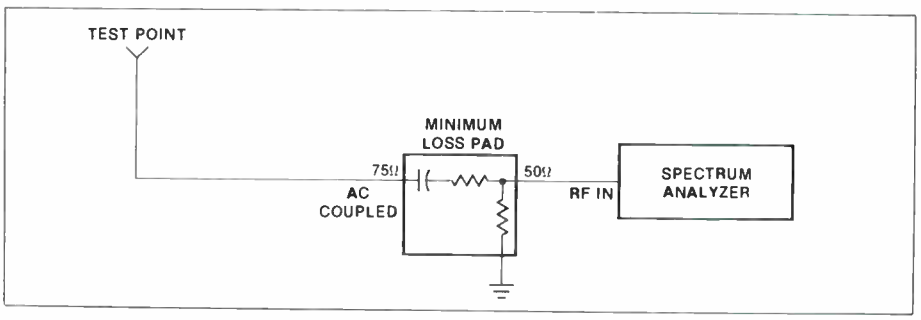

Figure 10-1 Equipment connection for hum measurements

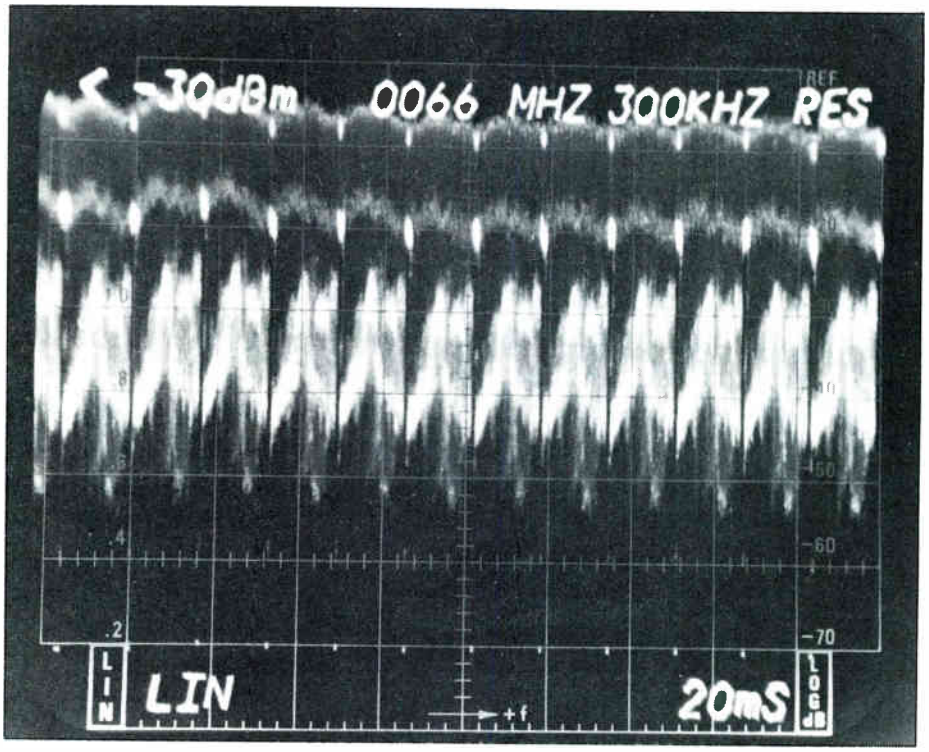

Figure 10-2 Measurement of hum and low frequency disturbance

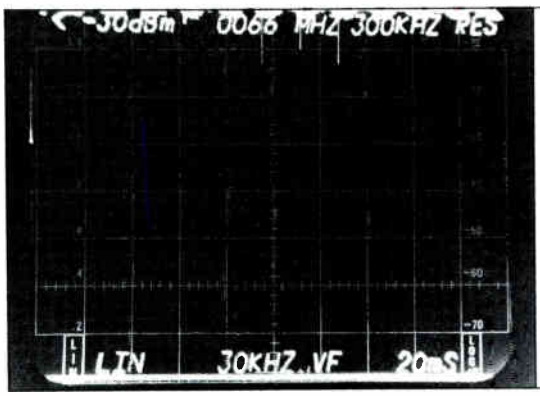

Figure 10-3
Measurement of hum with 7L14

Procedure

1. Set up the equipment as illustrated in figure 10-1.
2. Select 2 dB/DIV. Check vertical position.
3. Select a channel to be tested with the spectrum analyzer FREQUENCY control.
4. Unlock the FREQUENCY SPAN/RESOLUTION BANDWIDTH controls. Leave the resolution bandwidth in 300 kHz. Center the picture carrier on screen and narrow the span until Zero Span is reached. Adjust the REFERENCE LEVEL until the signal is near the top of the screen.
5. Select LIN (Linear) mode and use the REF VAR control to position the sync tips of the carrier to the reference level. Set the TIME/DIV control to 20 ms/DIV and select line trigger (figure 10-2).
6. Low frequency disturbance and hum is the peak-to-peak variation of the sync-tip-level expressed as a percentage of the maximum sync top amplitude. Each minor graticule division then represents 2.5 percent of low frequency disturbance and hum modulation.

Hints And Precautions

1. To get an idea of CATV distribution system hum contribution, use the foregoing procedure to measure the hum on a pilot carrier.
2. Picture-related disturbances and hum-related disturbances are at slightly different frequencies. Observe the sync tip amplitude carefully over a 17-second period to make sure that the worst case combination has been noted.
3. Digital storage capabilities of the Tektronix 7L14 make the measurement of the hum component easy. During the vertical interval the television signal is largely unaffected by picture content. This interval also contains long, high power pulses that can be accentuated with a video filter. Set up the 7L14 analyzer as per steps 3, 4 and 5. Turn on digital storage. Position the cursor at the bottom of the screen. Turn on the video filter. Press MAX HOLD and wait until the display builds up. The result (figure 10-3) is the hum on that carrier.

11. Terminal Isolation Measurements Capability

The terminal isolation measurement test can verify terminal isolation up to 70 dB over a frequency range from 100 kHz to 1800 MHz depending on the signal source used.

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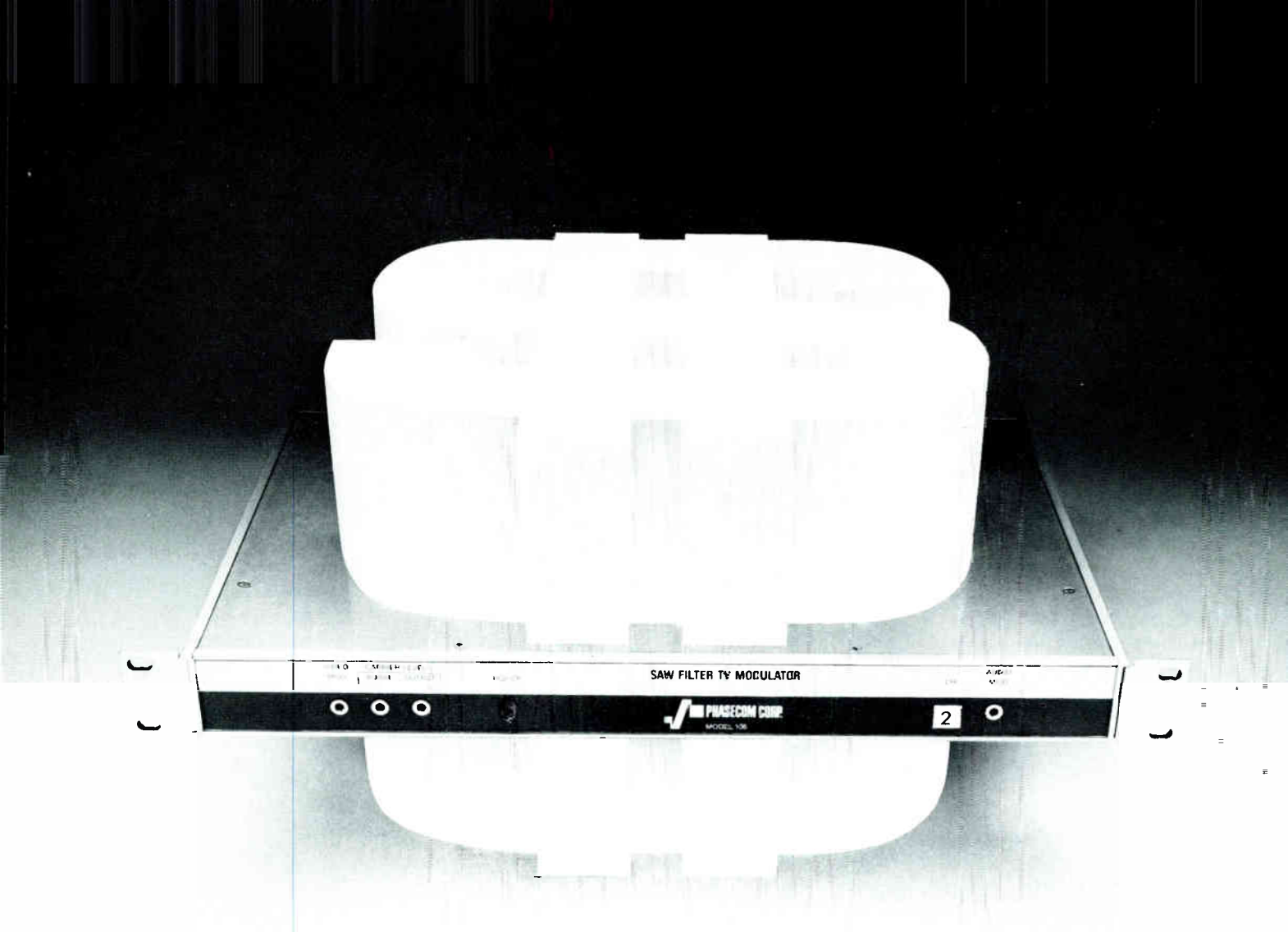

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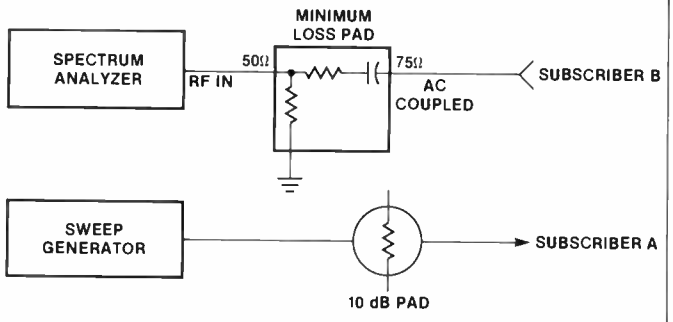

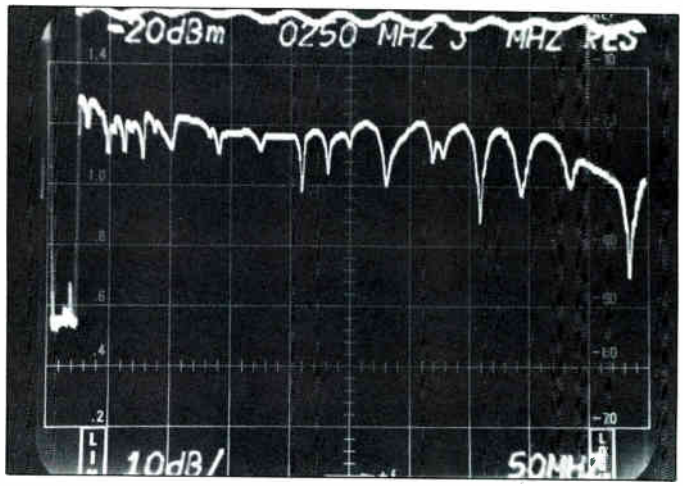

Figure 11-1 (left) Equipment connection for subscriber isolation measurement

Figure 11-2 (right) Subscriber terminal isolation measurement

Equipment Required

1. Spectrum Analyzer· Tek 7L12 or 7L14.
2. Mainframe· Tek 7613 or any other 7000 Series mainframe.
3. Sweep Generator· To cover the desired frequency range.
4. Minimum Loss Pad· Tek 011-0112-00 or 011-0118-00.
5. F to BNC Adapter· Tek 013-0126-00.

Procedure

1. Set up the equipment as illustrated in figure 11-1 at one location for calibration.
2. Set the spectrum analyzer's REFERENCE LEVEL to -20 dBm, SPAN/DIV to 50 MHz, RESOLUTION to 3 MHz and FREQUENCY to 250 MHz.
3. Connect (subscriber) point A to point B (figure 11-1).
4. Set the sweep generator for a CW output signal of about 250 MHz. Adjust generator amplitude so that the signal just touches the top line of the display.
5. Set the 7613 mainframe to STORE mode and adjust the sweep generator for a slow sweep. Experiment with the sweep generator's SWEEP TIME, the spectrum analyzer's TIME/DIV and BASELINE CLIPPER controls and the mainframe's storage controls until a display similar to figure 11-2 is obtained. If this display is more than 1 dB unflat, you might want to photograph this condition.
6. Without altering any controls, move the sweep generator output to subscriber terminal A and connect the spectrum analyzer input to subscriber terminal B.
7. Repeat adjustments as in step 5 to achieve display similar to figure 11-2.
8. The terminal isolation is the difference in dB (at 10 dB/DIV) between the trace in step 5 (terminals A and B connected together) and the trace in step 7.
9. Other frequency ranges can be tested with the same procedure.

   NOTE: For clarity this photo was taken using the 7L14's digital storage. Similar results (if not as photogenic) will be obtained using the 7613's CRT storage.

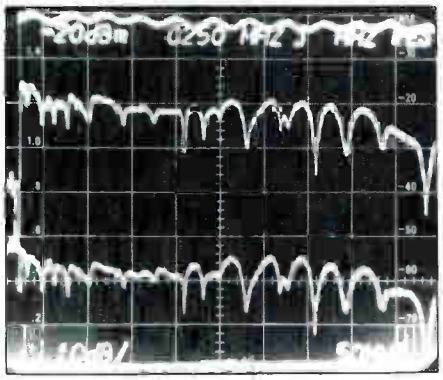

Figure 11-3 Direct measurement of isolation using B-SAVE-A feature

Hints And Precautions

1. Both traces can be recorded on the same photograph. Set the BASELINE CLIPPER for a clip level one to two divisions down from the top of the screen for step 5. Lower the BASE LINE CLIPPER to the fourth or fifth division from the top for step 7. Turn down the CRT READOUT until the measurements are finished. Then turn it up just enough to show the numbers for the photograph.
2. The digital storage of the 7L14 makes the terminal isolation measurement much easier. Move the PEAK/AVERAGE cursor to the bottom of the screen. Turn SAVE A OFF and MAX HOLD ON and perform step 5. After the reference trace is obtained turn SAVE A ON and turn MAX HOLD OFF and then back ON. Perform step 7. The display now has two traces and the terminal isolation is the difference between them. Pressing B-SAVE A provides a third trace that is the difference between the A display and the B display and which directly displays the measurement results. Figure 11-3 shows the display when a digital storage spectrum analyzer is used. (See 7L14 manual for selecting the offset of the B-SAVE A trace.)

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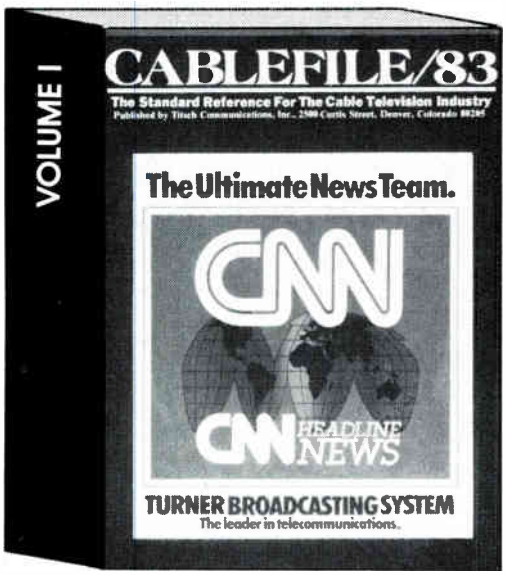

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12. Leakage Measurement Tests

The Tektronix 7L12, when used with the Tektronix 7K11, can be used to make wideband leakage measurements. These measurements satisfy FCC requirements and are easy to interpret. In most situations leakage can be determined by measuring channels in use on the CATV systems but not occupied by local stations.

Equipment Required

1. Spectrum Analyzer: Tek 7L12.
2. Mainframe (if required): Tek 7613 or any 7000 Series.
3. Preamplifier Plug-in: Tek 7K11.
4. Antenna: Homemade.
5. Camera (optional): Tek C-5C or equivalent.

Procedure

1. Set up the equipment as illustrated in figure 12-1.
2. Carefully calibrate the 7L12 and then the 7L12-7K11 combination (refer to instrument instruction manuals).
3. Connect the cable from the test antenna to the 7K11.
4. Position an appropriate dipole antenna 10 feet away from the point on the cable to be measured (100 feet away if below 54 MHz or above 216 MHz) and at least 10 feet away from the ground.
5. Using a resolution bandwidth of 300 kHz, measure the sync tip amplitude of any non-local CATV channels that appear on the analyzer's screen. Rotate the antenna from a horizontal position to a vertical position. The desired value is the maximum amplitude for any antenna angle. The 7K11's readout shows the reference level directly in dBmV.
6. Plot the measured values on a copy of figure 12-2. The measured values must be increased by the loss of the balun and the cable before being plotted.
   EXAMPLE: The measured leakage signal amplitude is -53 dBmV. Balun and cable loss together are 2 dB. Plot -51 dBmV on figure 12-2.
7. If all the points plotted are below the curve the FCC requirements are being met.

Hints And Precautions

1. Construction of homemade dipoles, using 300 ohm TV twin lead is illustrated in figure 12-1. The lengths of the dipoles (in inches) for various frequencies are listed in figure 12-3. Each dipole should be mounted on its own (non-metallic) board as illustrated by dashed lines in figure 12-1. The loss of the balun is one-half the loss of two baluns with their 300 ohm terminals connected together. Measure the loss of the cable by normal methods.
2. If radiation and amplitude measurements are made at the same location, the spectrum of the two can be compared to locate the frequency of the CATV-only channels.
3. Storage can be used to hold the maximum value of each signal as the antenna is rotated.
4. Single-frequency dipole antennas usually have a limited bandwidth. Do not make measurements beyond a channel or two on either side of the channel which the antenna is cut for. Measure the dipole antenna to verify that its return-loss is maximum at the design frequency. Adjust length as necessary.
5. For highest accuracy use a non-metallic tripod to mount the dipole antenna.
6. Because of the nature of radiation and the many variables affecting its measurement, we recommend that any leakage encountered be corrected so that no indication of leakage can be measured. This is far better than certifying a marginal leakage condition.

CED

Linley F. Gumm 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, Ore., Gumm has been associated with the development of many quality spectrum analyzer instruments.

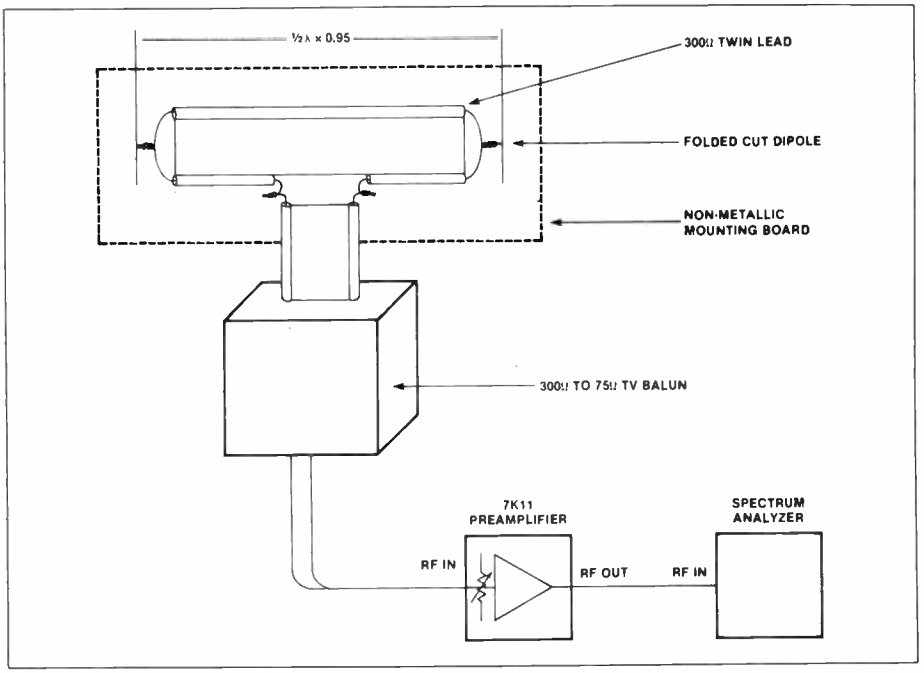

Figure 12-1 Details of homemade antenna and equipment connection for leakage measurements

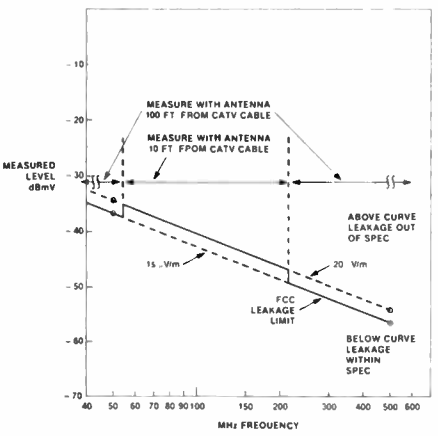

Figure 12-2
FCC leakage specifications as measured with a ½ λ dipole.

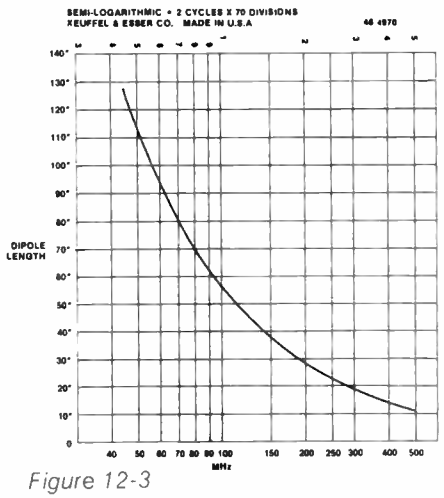

Figure 12-3
½ λ dipole length vs. frequency

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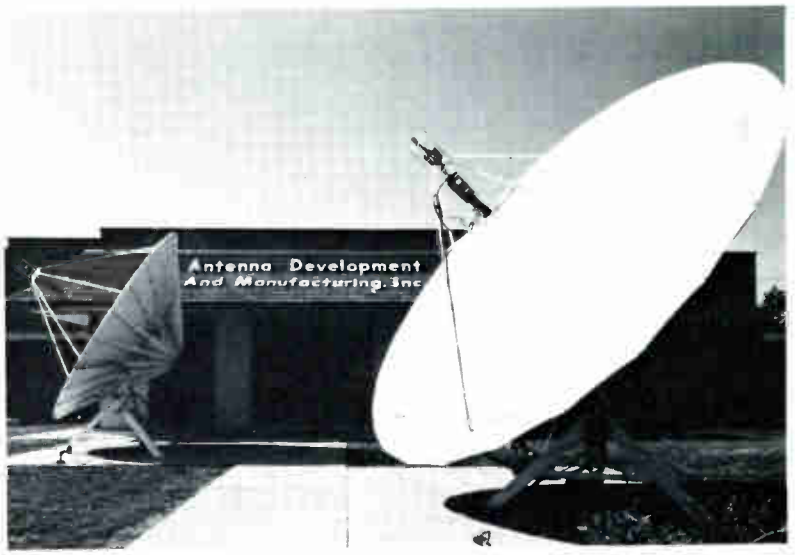

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Effects Of Multiple Audio On CATV Systems

Proposals for multiple TV audio systems affect almost all of the major elements used within the CATV system. Although these proposals will substantially affect the headend and CATV amplifiers, this report, from Pioneer Communications, concentrates on the impact new audio systems will have on CATV converter/descrambler-type devices.

By Michael Hayashi and T. Kanazashi, Pioneer Communications of America Inc.

The three multiple TV audio systems that have been proposed (Zenith, EIA-J and Telesonic) are fundamentally very similar. The change from monaural FM audio to multiple audio requires a much wider modulation bandwidth to accommodate the added subcarriers. Also, the problem is aggravated because all proposed multiple audio systems place subcarriers at a certain harmonic carrier frequency of the TV horizontal frequency. From an RF performance specifications standpoint, the system elements that will be most affected and therefore should be carefully evaluated are:

- Distortion characteristics
- Signal-to-noise ratio
- Buzz interference*
- Buzz beat interference*
- Crosstalk interference
- Stereo separation

*Buzz is a sound whose frequency is a harmonic of the line frequency. Buzz beat is spurious signal caused by the interference between the line frequency and the horizontal frequency. The name is derived from the "buzzing" sound associated with interference. Buzz and buzz beat are by far the most important distortions to eliminate in the transmission of quality multiple audio.

In addition, all scrambling that utilizes the audio carrier as a source of "tagging" and/or scramble key signal will be affected drastically.

The following problem areas are common to all converters used in the CATV industry:

- **Frequency response** within the occupied TV bandwidth can cause AM TV signals to undergo phase modulation, due to frequency accuracy and stability problems resulting in buzz and buzz beat interference. (Relatively small changes in frequency are often interpreted as phase variations.)
- The **delay characteristic** of an audio carrier's occupied bandwidth contributes to degradation in crosstalk, distortion and stereo separation specifications.
- **Audio level variation**, caused by effective change in frequency response due to unstable output frequency, contributes to the degradation of the signal-to-noise ratio and causes buzz and buzz beat interference.
- **Intermodulation** in the mixer and amplifier stages results in buzz and buzz beat interference and affects any active devices that may be in use in a CATV system.
- The **interference to converter AFC** ciruit causes buzz and buzz beat when AFC is locked to a video carrier.
- **Phase modulation on converter local oscillator** on PLL-type devices causes buzz and buzz beat.

The degree of the problem differs from converter to converter and depends on the type of design employed. Design types can be classified largely as: PLL/AFC converter (frequency-synthesized PLL on first local oscillator and AFC on output—e.g., Pioneer BT-series); tuneable converters (voltage-controlled, first local oscillator without PLL or AFC, referred to as "plain Jane," e.g., Pioneer BC-2000 series); and a combination of the above, including scrambling and in-band data communication, tagging and baseband methods.

PLL/AFC Converter

In a PLL/AFC type converter, the first local oscillator is controlled by PLL and the second local oscillator by AFC. The advantages of this design are tuning frequency accuracy and stability, which substantially decrease overall converter frequency response characteristic changes. Consequently, problems relating to frequency response are minimized.

Frequency response in relation to AM signal phase modulating results in buzz and buzz beat. When multiple audio is transmitted—depending upon the video IF selectivity characteristics—phase modulation occurs on the video carrier. This phase modulation produces buzz interference for TV sets that use the common inter-carrier method.

Once the video carrier is phase modulated, the 15.75 KHz horizontal equalization signal becomes phase modulated. Due to the non-linear characteristic of the video IF amp, the audio carrier also becomes phase modulated, causing a beat with the 2 x F (horizontal) and resulting in buzz and buzz beat interference. The degree of interference is greater for higher modulation frequencies

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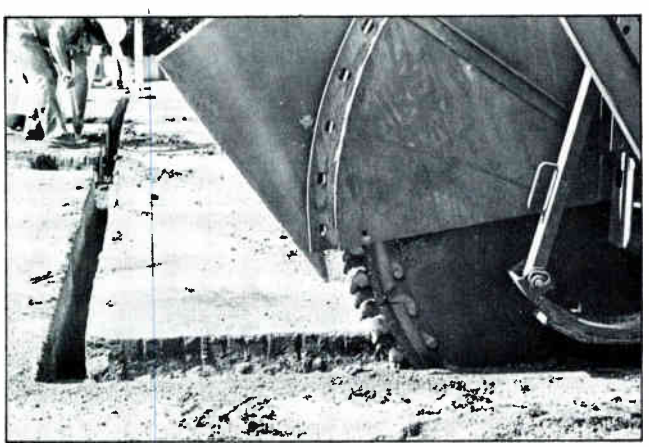

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of the multiple audio and is especially severe for intercarrier-type TV receivers.

When a converter is placed before the TV receiver, its interfering effect must be minimized. This is accomplished by ensuring that the converter has a sufficiently flat frequency response. Furthermore, in situations where adjacent channel interference (upper and lower video must be rejected by at least 10 dB) must be eliminated while sufficient pass band is provided for the multiple audio, the filtering within the converter must have a very high Q factor (filter sharpness). One possible solution is the use of a SAW filter, which increases converter cost and is currently in use in Pioneer addressable converters.

Generally, if the delay characteristic of the audio carrier's pass band is poor, degradation in crosstalk and distortion can be expected. In the case of FM stereo, more than 80 KHz of bandwidth is required, and the delay characteristic must be made constant (flat). The delay time itself must be kept within 2 to 3 microseconds. Using a conventional L-C type bandpass filter, an 80 KHz bandwidth filter with the 2 to 3 microsecond delay characteristic can be designed. However, considering production and possible field variation, components like SAW filters should be used.

In CATV systems, the audio carrier is typically transmitted at 15 dB below the video carrier (for AML, it is 17 dB). Signal-to-noise ratio at this level is relatively poor, and the condition is aggravated by noise from the converter. In this case, FM stereo's secondary audio carrier's (the L-R, primary is L+R) signal-to-noise is the most affected. For the converter to perform properly, the output bandpass filter must have a very sharp response characteristic. Once again, a SAW filter is highly desirable. Audio level variation is caused by change in frequency response.

The subcarriers used for multiple audio systems are located at multiples of the TV horizontal equalization frequency (Fh). For this reason, intermodulation occurring in the cable equipment (amplifiers and converters) accumulates on the audio carrier and may result in buzz beat interference. Commonly, the 15.75 KHz components of the intermodulation contains phase-modulated signals that actually beat with the audio subcarriers. Intermodulation caused by the mixer and amplifiers within the converter results.

As shown in figure 2, the D/U (desired-to-undesired signal) ratio must be greater than 40 dB in reference to the audio carrier. This value is a minimum requirement for acceptable audio reception. The comparable video value translates to 55 dB of D/U ratio and is conceptually very similar to cross modulation. For this reason, today's cross modulation spec must be improved. A detectable cross modulation limit for video is said to be 50 dB. This value becomes a detectable (audible) interference in audio. Since the Zenith method uses the Fh as a subcarrier pilot, the possibility exists that the multiple audio receiver may erroneously detect the interference as a pilot. As a result, maximum input level to the TV set (or converter output) could be limited. To avoid this problem, the cross-mod specifications of converter products must be improved.

Phase modulated buzz components, present on the video carrier and caused by intermodulation, can be detected by the AFC circuit's phase detector. This signal, output as buzz-modulated AFC control voltage to the local oscillator, results in FM modulation of the second local oscillator. This may be detected by the receiving TV set as a buzzing sound. To prevent this type of interference, it is necessary to change the AFC detection time (increase) to the extent that it does not experience the effects of the AFC buzz modulation.

When PLL circuits are used in converters, the local frequency—for which PLL is used—experiences a certain degree of phase modulation caused by the PLL. If the PLL is very stable (i.e., has high resolution) or if the input signal's carrier-to-noise is very good, the degree of phase modulation is substantially reduced. If phase modulation occurs, the TV signal would be phase modulated and, as a result, 15.75 KHz would also become phase modulated. This signal, going through the non-linear converter amp and/or mixer stages, will show up on the audio carrier spectrum as spurious signal. This spurious signal and the audio subcarrier beat against each other to produce buzz beat. PLL-type devices must have sufficient C/N ratio to work in TV multiple audio systems.

Standard Tuneable Converters

With the exception of those problems relating to AFC and PLL, the problems found in standard tuneable converters are similar to those found in all CATV converters. However, with tuneable converters, the problem associated with frequency drift is more severe. Typically, tuneable converters do not have any stabilization control for either the first or the second local oscillators. Unstable local oscillators result in a variable output frequency response characteristic. (Even if the output filter is stable, the input signal is not; therefore, the output signal will not have a flat frequency response characteristic.)

There are two possible situations that may account for changes in frequency response characteristics. First, it is very difficult to determine the correct output frequency from the converter. The TV picture is aligned by using the fine tuning on the converter. In most situations, the converter output is not tuned to the correct frequency and thus, is affected by the converter output frequency characteristic. In this state, the wide frequency range of a typical TV set may account for the clarity of the TV picture. The effect of the frequency inaccuracy from the converter can be compensated, to an extent, by TV sets with AFT. With AFT, off, typical tolerance is ±100 to 200 KHz, and with AFT on, ranges from 1 to 3 MHz are covered. However, this contributes to a situation wherein the output frequency from the converter may look correct on the TV set picture but may not be centered on the converter output frequency.

The second possibility for frequency response characteristic is compensation resulting from the TV set's own frequency drift by converter fine tuning. This situation is extremely rare. Multiple audio-capable TVs must have very accurate tuning mechanisms such as PLL-synthesized tuning.

In both cases, we conclude that very narrow output frequency response is not desirable, because it is difficult to fine tune the converters correctly. A wide output frequency response is undesirable because of adjacent channel beat. In conclusion, converters with fine tuning may have numerous problems in multiple audio broadcast, and converters must have *accurate and stable* output to ensure proper frequency response characteristic. AFC is required to achieve this characteristic. The addition of AFC to new converters would cost the operator approximately $5. Modification to exisiting converters would cost more and is probably not practical.

The scrambling systems available in the CATV industry today are not compatible with multiple audio systems. Scrambling systems can be affected by, and will themselves affect, multiple audio broadcast.

Scrambler/Descrambler Systems

The purpose of a scrambling system is to encode TV signals so that a normal TV set cannot receive a viewable picture. While numerous methods are available, the most common technique is the suppression of the sync pulse by some analog signal such as sine wave or square wave. In all scrambling systems of this type, the method itself generates spurious signals at harmonics of the TV horizontal frequency. In analog types of scrambling, the scramble key signal is commonly AM-modulated on the audio carrier, and the key signal modulation frequency corresponds to the TV horizontal frequency and/or its multiple. In all of the proposed TV multiple audio systems, a direct conflict results because

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multiple audio key signals also are found on the harmonics of the horizontal frequency. The effect is twofold: Multiple audio broadcasting may cause the descrambler to operate, effectively scrambling a non-scrambled picture; and a scrambling key signal interferes with the audio information.

A scramble key signal may also be digitally encoded within the TV spectrum either on a separate subcarrier or in the VBI. In the case of VBI key signal encoding, the converter/descrambler must perform baseband processing to extract the scramble key signal. If audio were untouched in the process and mixed at the output, the effect of multiple audio could be minimized to that of other regular converters. However, for baseband units with full audio control, the function of multiple audio must be built in directly to the converter, adding substantially to the cost of the device. A 15-25 percent cost increase should be expected to accommodate multiple audio. Scrambling systems cannot now coexist with multiple audio, and that problem will have to be resolved by vendors. In most cases, the scrambling system will have to be replaced, which may mean an enormous cost for cable operators. New compatible scrambling/ descrambling systems can be expected to cost at least 10-20 percent more than today's available systems.

Cost Impact

According to preliminary studies, the majority of converter products in use today will be affected by the implementation of multiple audio. The problem is further magnified in systems where scrambling of some sort is performed.

An ideal converter is a converter with a very stable and accurate output frequency and a very flat and sharp overall frequency response characteristic. Using existing technology, this could be achieved by several different methods. Assuming that PLL tuning, output AFC and SAW filter are the necessary ingredients in a multiple audio compatible converter, the cost is 20-30 percent greater than existing tuneable converters. Although the degree of difficulty involved in upgrading or modifying existing converters in the field will vary from vendor to vendor, it will not be a simple matter of alignment. Most likely, old converters will have to be replaced with improved converters.

Scrambling/descrambling systems make the problem more complicated and costly. Although no solutions can be proposed at this time, it would be safe to assume a minimum cost increase of 10-20 percent over existing designs. This increase does not include the research and development cost involved in designing a scrambler/descrambler that is compatible with multiple audio systems.

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It was a tall order, but early in 1980 Telease took on the task and assembled a staff of more than 40 scientists, engineers, and technologists to create such a system. Most members of the Telease Technology team have advanced engineering degrees and more than ten years experience designing secure military communication systems. The MAAST (Multiple Application Addressable Secure TV) system is the product of more than two years work of this dedicated team. To meet the stated requirements took the design and implementation of three custom microprocessors, a custom LSI chip, a high security multi-key encryption system, and the use of advanced modulation techniques.
The result . . . MAAST does more.
It establishes a new state-of-the-art standard for subscriber-based systems.

Call Or Write For More Information:

For a MAAST system description, a schedule of worldwide demonstrations, an appointment for a private demonstration at Telease facilities, or to schedule a MAAST test on your system, please call, write, or telex: Dave Block at Telease, Inc.

We promise a lot; we deliver even more.

You Told Us You Want:

- ☑ A reliable high-quality, addressable system at an affordable cost.
- ☑ Secure transmission, data encryption, and hardware that pirates cannot defeat.
- ☑ A system that provides both tiering and impulse-pay-per-view (IPPV) for one-way systems (and is compatible with two-way upgrades).
- ☑ A 440MHz, 120 channel tuning system with dual cable inputs and automatic A/B switching. (plus UHF for some applications).
- ☑ An audio system that provides stereo and multiple language capability within the standard TV bandwidth.
- ☑ A subscriber control system that permits lock out of selected programs or channels (parental control).
- ☑ An expandable system architecture that is ready for two-way cable, interactive teletext/videotext/transaction TV, and home security.

You Get A Big Bonus For Having Waited:

The MAAST system not only meets the stated requirements, it also provides three important additional benefits:

- ☑ MAAST will reduce installation, operating and service costs.
- ☑ MAAST will open profitable new business opportunities.
- ☑ MAAST will increase retention (decrease churn) by increasing subscriber satisfaction.

MAAST™ Demonstrations

PHILIPPINE FILM FESTIVAL
JAN. 24, 1983
MANILA, PHILIPPINES

MAAST™ Deliveries:

Orders will be accepted for early '83 delivery and thereafter. Manufacturing commitments for one million units a year have been made with a large high reliability manufacturer. Deliveries will begin Feb/Mar, 1983. Second and third source suppliers will be available mid'83.

The MAAST system is based on Telease, Inc. proprietary technology and is covered by worldwide patents, and patents pending.

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International News

TFC To Enter U.K. Cable Market

ANDOVER, England—Times Fiber Communications of Wallingford, Conn., will enter a joint venture with United Engineering Industries of Andover, England. The joint venture will focus on TFC's adaptation of Mini-Hub fiberoptic high-rise TV distribution system to British requirements. The new company will be named Times Fiber Communications Ltd. and will manufacture, sell and install Mini-Hubs in England.

Wegener Receives Canadian Pay-TV Contracts

ATLANTA, Ga.—Wegener Communications Inc., a U.S manufacturer of satellite-audio transmission equipment, has received contracts for the purchase of its Series 1600 stereo transmission system from the Canadian-based Superchannel. Superchannel is an operator of regional pay-TV in Alberta and Ontario, Canada.

Wegener Communications Inc., headquartered in Norcross, Ga., and its Canadian distributor, Sigmacom Systems Ltd., were awarded the Alberta and Ontario contracts after extensive testing was conducted by Superchannel and Telesat Canada.

Commenting on the Superchannel decision, Ned Mountain, marketing manager for Wegener Communications, said, "I am delighted with our company's continued growth in the Canadian cable market and with Superchannel's commitment to full-stereo audio for its pay TV customers."

Installation of the two Wegener Series 1600 stereo transmission systems is expected to start soon.

Maclean Hunter Wins Engineering Award

ONTARIO—Maclean Hunter Cable TV of Ontario, Canada, won this year's E.R. Jarmain Award for Innovation in Engineering for their development of a sophisticated computer-controlled mobile test facility. Presented annually by the CCTA, the E.R. Jarmain Award is given to those responsible for developing a project that successfully combines creativity, imagination and practicality with innovative engineering and technology.

Maclean's computer-controlled mobile test facility, the result of several years of work by a group of Maclean Hunter CATV engineers and technologists led by Geoff Heathcote, expediently and automatically compares cable system performance with D.O.C. or FCC specifications. The measurements provide for fast, accurate and cost-effective analysis in both new-build and mature system operations.

Eagle Comtronics Finds European Distributor

BRUSSELS, Belgium—Eagle Comtronics Inc., a Syracuse, N.Y., manufacturer of CATV passive devices and other hardware, has signed a product distribution agreement with Siemens S.A. of Brussels, Belgium. According to the agreement, Siemens, which presently controls more than 30 percent of the European cable television equipment market, will distribute Eagle's full line of products throughout Europe and Scandinavia.

In return, Eagle Comtronics has agreed to help Siemens develop addressable hardware technology. Eagle Comtronics manufactures a full line of headend scrambling and home addressable descrambling terminals.

Classifieds

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CHIEF TECH—Take charge of this 700 mile plant in Florida. Must have headend maintenance and outside service experience; as well as ability to supervise up to 20 people. Light travel with attractive salary and benefit package.

CHIEF TECH—supervise 15 employees with occasional travel in this upper Midwest system. Must know headend, have ability to climb, and be able to perform FCC proof-of-performance testing. Excellent salary with room to grow.

CHIEF TECH—FCC license required for this state-of-the-art, 400-mile plant system in the South. Must be able to supervise 15 employees and perform FCC proof-of-performance test. Salary in $20s.

MANAGER—Position just right for Assistant Manager of small system manager to advance. This 10,000 sub system is located in the upper Midwest. Excellent salary with lots of growth opportunity.

ENGINEER—BSEE required for this opportunity to handle state-of-the-art system in the Midwest. Salary is $30,000.

DIRECTOR OF ENGINEERING—BSEE plus 5-10 years of hands-on CATV experience in large system or corporate engineering environment required. Salary in $50s with excellent benefit package.

SYSTEMS ENGINEER—We need you to oversee this 54-channel, 40,000 sub system in upper Midwest. $30,000 salary with above average benefits.

MANAGER OF ENGINEERING—BSEE plus 5-10 years of hands-on CATV experience in large system or corporate engineering environment required. Salary is $50s with excellent benefit package.

SYSTEMS ENGINEER—We need you to oversee this 54-channel, 40,000 sub system in upper Midwest. $30,000 salary with above average benefits.

MANAGER OF TESTING—Set up testing lab and procedures for field testing of RF products. BSEE plus 5 years in RF environment required. Salary is $35,000.

FIELD SUPPORT ENGINEER—Be responsible for providing local support for all field project managers. Salary is in $40s with 20 percent travel.

FIELD TECH—Duties involve service calls, sweep & balance, and outside troubleshooting. Must have good driving record. $8.00 to $10.00 per hour with excellent benefits.

SERVICE TECH—Run service costs and troubleshoot in this excellent North Carolina location. Salary is $4.00 to $7.00 per hour.

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NATIONAL SALES MANAGER

System design and implementation firm with electronic equipment manufacturing division for the cable television and LPTV industry requires national sales manager to establish rep network, and supervise all aspects of product and service marketing including: advertising, direct mail, trade shows, etc. Ground floor opportunity to grow with small but rapidly expanding firm. Send resume including experience and salary requirements to:

Box: CED 1282-1

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(303) 295-0900

PROJECT ENGINEER

Excellent opportunity for experienced hands-on tech with fast growing MSO in Tennessee (20,000 subs). Minimum 7 years CATV experience, willing to travel Middle and East Tennessee. Second class phone preferred. Must have references and knowledge of all phases of CATV engineering, including design and construction supervision, with the ability to stay within budgets and complete projects on time. This position will report directly to the regional manager.

An equal opportunity employer.

Send resume to:

Bob Pace, Regional Manager
National TV Cable Company
P.O. Box 328
McMinnville, Tenn. 37110

CONSTRUCTION MANAGEMENT
FIELD ENGINEERING

TIMES FIBER COMMUNICATIONS—long known for its high quality CATV coaxial cable has become the leading innovator in the development and installation of the new cable TV technology of FIBER OPTIC SYSTEMS.

In addition to our cable television Fiber Optic Trunking Systems, we have developed and installed the first fiber optic, two-way, fully addressable computer control distribution system designed to replace conventional coaxial distribution networks.

Recent contracts for major MSO builds nationally, require us to add to our Installation Engineering Division several veteran PROJECT/CONSTRUCTION MANAGERS AND FIELD ENGINEERS, to direct and support these plant constructions. Initial assignments will be for 6 months to 1 year in any one of several locations throughout the United States, including California, the Midwest, Mid Atlantic, Southern and Northeast regions.

PROJECT MANAGERS

TOTAL TURN-KEY RESPONSIBILITIES for major plant constructions.

Duties include selecting and on-site monitoring of construction contractors; planning and scheduling of construction and materials ordering; budget administration; administration of local construction authorizations with local municipalities and utilities. Supervising all required systems testing performed by your Field Engineer.

Requirements: minimum 8 years in the CATV industry with significant construction supervisory experience. At least 2 years as a Turn-Key Project Manager. Must have sufficient electronics experience (some relevant education preferred), to provide direction for testing and debugging of cable TV electronics for FCC proofs.

SYSTEMS ENGINEERS

Responsibilities: specification of customer's system requirements and system design. Determination of system requirements for Engineering, Manufacturing and Construction. Technical evaluation of field performance data, with some field service support for our fiber optic network. Some travel required. Position based in Wallingford, Connecticut.

Requirements: BSEE with minimum 5 years experience in RF circuit design and/or communications systems design, (video, CATV, or CTV). FCC Proof Performance and NTC 7 test experience preferred.

FIELD ENGINEER/TECHNICIAN

Minimum of ASEE required with minimum 2 years hands-on experience in FCC Proof Performance Testing as well as all related installation and testing of CATV electronics. Prior Fiber Optics experience NOT required. Relocation to field locations required (6 months to 1 year at each assignment).

These positions are available immediately and offer the cable television professional the opportunity to expand your expertise to include the application and installation of fiber optics cable and related electronics.

Qualified and interested candidates may call, toll free 1 (800) 243-6904 (in Connecticut, 1-265-8500), or write including resume to: Doug Fuchs, Employment Manager in Wallingford, Connecticut.

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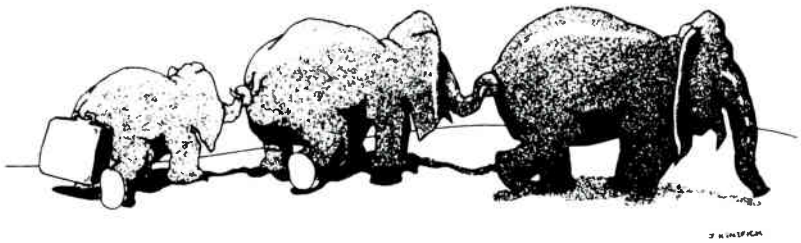

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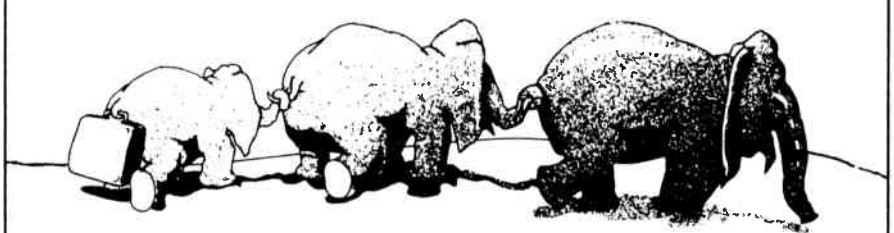

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AD INDEX

CED

People News

★ **Richard Davis** has been appointed vice president, staff operations, metro division for **Warner Amex Cable Communications.** Davis, who previously Dallas, will assist in the development and implementation of programs designed implementation of programs designed specifically to realize the full potential of Warner Amex's metro operations which include all QUBE two-way interactive systems.

Also at Warner Amex, **Ronald Giles** has been promoted to the newly created position of vice president, broadcast operations, and **James Mazur** has been promoted to the newly created position of vice president, operations, for the Warner Amex Pittsburgh system.

Giles, who had been programming manager, will now be responsible for programming and advertising sales. Mazur, who had been vice president, finance, will now be responsible for customer services, repair services, installations, demand maintenance, terminal operations, data base facilities and fleet operations.

★ **Rudolph Roscher** has been appointed president of **Magnavox CATV Systems Inc.** Previously, Roscher was executive vice president and general manager of the company.

Also at Magnavox, **Thomas Dolan** has been appointed account executive. In this function, Dolan will be responsible for accounts in Georgia and Florida.

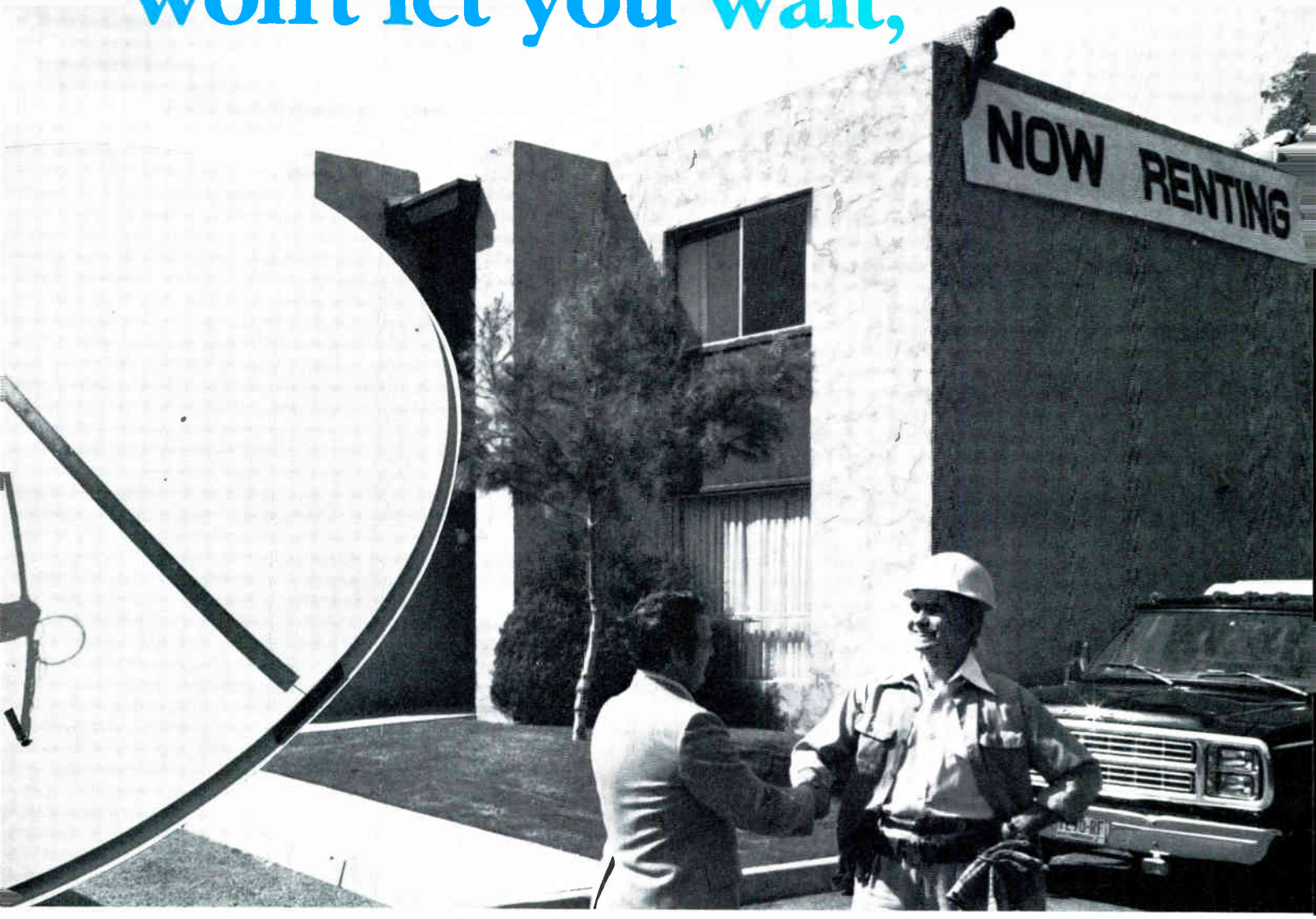
Tom Dolan

★ **Capscan Cable Co.** has named **Virgil Faulkner** as its new vice president for sales. Faulkner has more than ten years experience in CATV and industrial electronics sales and has been the regional sales manager for S.A.L. Cable Communications north central region for the last two years. He also spent two years with Jerrold Electronics as midwest district sales manager.

★ **Ray Tomko** has been appointed to the position of director of operations at **Cable and Computer Technology Inc.** In this capacity, Tomko will be responsible for the overall operations of the company.

Most recently, Tomko was director of operations for the musical instrument division of CBS. Previously he was employed at Anaconda Electronics where he held various positions including manager of customer service, quality assurance, turnkey systems design and assistant director of research and development. Tomko received his formal education in electrical engineering at Ohio State University and has additional education in computer systems design.

When a contract deadline won't let you wait,



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If you're trying to save money by purchasing from several different sources, it could end up costing you a bundle – in lost time. And you might be sacrificing performance too.

Comtech, a major manufacturer of TVRO equipment, can ship you – direct from stock – all the components for a total TVRO system. One that has been pre-packaged and performance tested as a system. Comtech can save you both money and time. And give you top performance too.

Comtech's antennas, receivers and modulators will provide your customer many years of trouble-free service. We build the equipment ourselves, using quality control and testing methods that are amongst the most stringent in the industry.

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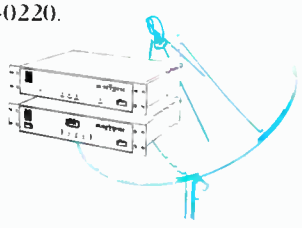

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Product News

New Ku-Band Earth Station

Scientific-Atlanta Inc. has announced its new Ku-band earth station receiving system that receives satellite TV transmissions from 11.7 to 12.2 GHz. The system is comprised of a Series 9000 Ku-band earth station antenna, a series 361 low-noise converter and a Model 6651 video receiver. In addition to Anik C specifications, the system also has similar configurations for SBS, OTS and ECS. Other satellites are also available.

According to the company, the Ku-band system is able to offer high performance and economy through its series 9000 antenna and Model 6651 receiver. The Series 9000 antenna is designed for high-quality reception and convenience, while the Model 6651 and low-noise converter are used together for block downconversion, which eliminates the need for expensive microwave components in each receiver.

For more information, contact Scientific-Atlanta, (404) 925-5947.

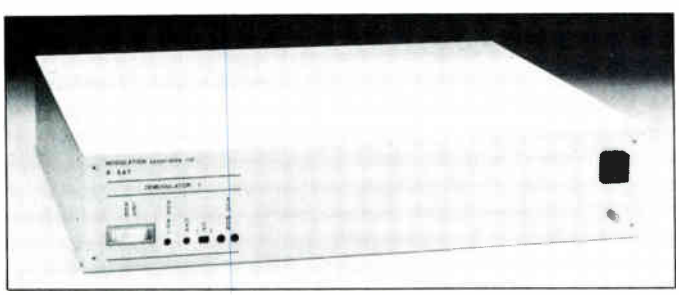
Modulation Announces R-SAT SCPC Receiver

Modulation Associates has announced its new "optimized" SCPC audio satellite receiver called the R-SAT. The company believes that its R-SAT SCPC receiver will meet the needs of California state and regional radio networks for quality and relatively inexpensive satellite distribution.

Through the use of an optimized SCPC demodulator and a 3.7-meter antenna, the R-SAT reduces satellite power from 80 to 10 watts, which in turn cuts space segment costs from $12,000 to $2,000 per month. In addition to the space segment savings, the eight-to-one reduction in required uplink power and complexity also reduces the typical uplink cost from $500,000 to $150,000.

The R-SAT receiver also allows individual program channels to be uplinked independently from state capitals throughout the U.S., thereby permitting shared use of a common satellite and transponder with national radio networks.

For further information, contact Modulation Associates, (415) 962-8000.



Modulation's R-SAT, a SCPC audio satellite receiver

Lectro Develops New Sentry

Lectro Products Inc. has announced the development of its most recent cable TV standby power unit, the new Sentry. The Sentry is offered with a five-year warranty, which, Letro Products Vice President Mason Hamilton maintains, demonstrates the company's "continued commitment to our customers." The system's components are accessible for servicing and are all pre-wired except for the battery and input AC connections from the power company.

According to the company, the major advantage the Sentry offers is its convenient servicing. Test points, output current and battery voltage meters are located on the face of the unit for easy reading. The unit accommodates Group 31 batteries and comes equipped with a slide-out battery tray. Upon request, the status monitoring interface can be built into a drawer for easy access.

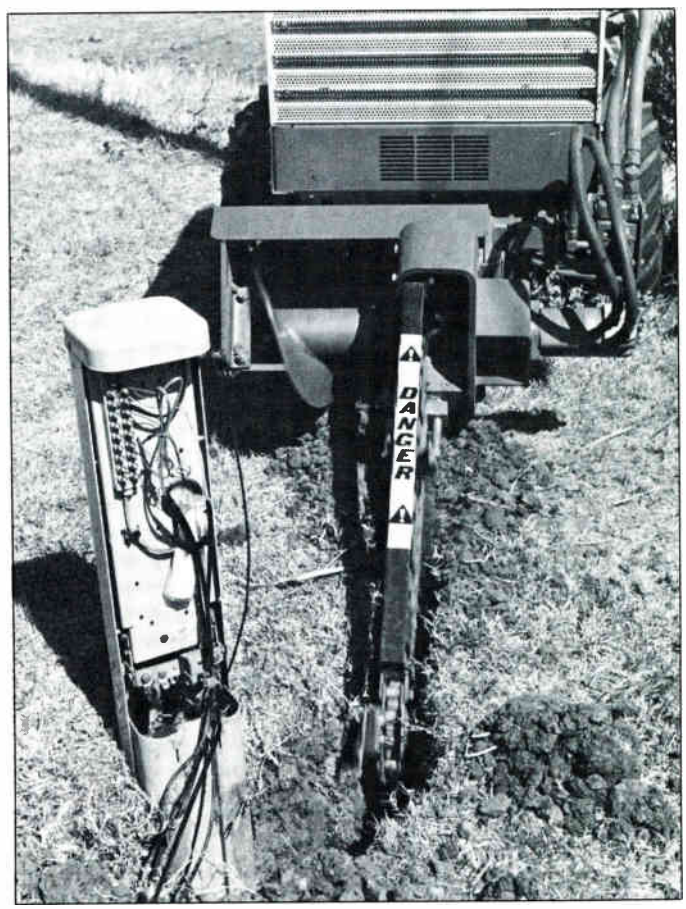
The unit offers heavy-duty surge, automatic overload and short-circuit protection and can be automatically switched to standby when the regular supply module is unplugged.

For more information, contact Lectro Products, (404) 353-1159.

Ditch Witch Announce New Trenching Accessing

Ditch Witch has introduced a trenching accessory for the 350SX vibratory plow. This hydrostatic trenching attachment, designed for digging starting slots, enables vibratory plowing installation to begin at specified depths. The trenching accessory plugs into the 350SX vehicle's hydraulic manifold and will trench to depths of two feet.

For more information, contact Ditch Witch, (406) 336-4402.



Ditch Witch's new trenching accessory

Texscan MSI To Manufacture DIP-Compatible Hardware

An agreement was reached between TV Watch/DIP and Texscan MSI to add Texscan MSI's SpectraGen and Flexicaster series to the line of hardware compatible with DIP (Distributed Information Processing) electronic cable guide software.

Dennis Campo, national marketing director for TV Watch/DIP, said, "Signing this agreement with Texscan MSI means that cable operators now have complete flexibility in the hardware they choose to use with our customized cable listings."

Both the SpectraGen and the Flexicaster series feature batch transfer for remote control of several systems' program guides and for remote diagnostics and mosaic graphics for display ads. Available on a purchase basis, these units can accommodate low-cost software that can retrofit system components already in place to make the unit DIP compatible.

For more information, contact TV Watch/DIP, (404) 355-0100.

Mini-Cable System Package From Scientific-Atlanta

Scientific-Atlanta has introduced a mini-cable system package. The system includes the new Series 9000 2.8- or 3.2-meter earth station antenna, field-tested Model 6650 video receivers, a low-noise converter and compact modulators. Complete headend cabinetry, connectors and headend wiring are also provided.

According to John Levergood, vice president of Scientific-Atlanta, the system "enables the cable operator to accelerate delivery of programming to outlying service areas with minimum cost and manpower."

The system uses the block-down conversion technique for adding channels. Earth station electronics include a model 360-1 LNC and model 6650 video receivers. The system's model 6330 TV modulators can be mounted in one 19-inch rack width and provide IF loop-through for headend channel scrambling and spectrum inversion for channel block converters.

In addition, the unit's series 9000 earth station antennas offer a variety of options that can be configured to meet the cable operator's needs.

For more information, contact Scientific-Atlanta, (404) 441-4000.

Harris Earth Station Easily Transported

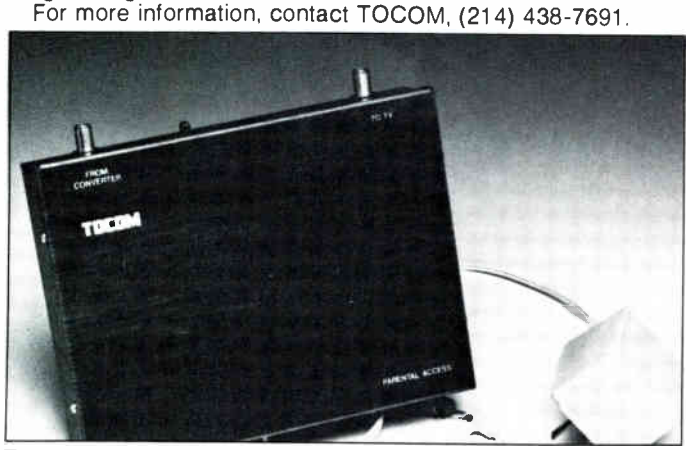
Harris Corp. has introduced its easily transportable (E.T.) 6.1-meter earth station antenna, the Intelsat Qualified Antenna. This high-gain antenna achieves full elevation coverage without field adjustments and, when equipped with the properly polarized feed sub-system, can operate with any Domsat or Intelsat Geostationary Satellite from any location on the globe. With the assistance of an experienced three-person crew, the antenna can be erected in the field without cranes or hoists and can be set up and operable within 24 hours. All antenna subassemblies can be loaded on a 2.5-ton truck or in the cargo bay of either a C-141 or C-130 aircraft.

For more information, contact Harris Corp., (214) 984-0555.

TOCOM improves graphics capability

TOCOM Inc. improved the graphics capability of its 55 Plus two-way addressable converter for display of teletext and videotex. Graphics for the 5510 Home Information Terminal have been upgraded from 32 characters by 16 rows to a 40-character by 24-row graphics screen capability. The upgrade permits the 5510 to deliver British Standard PRESTEL format graphics in a range of eight colors.

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

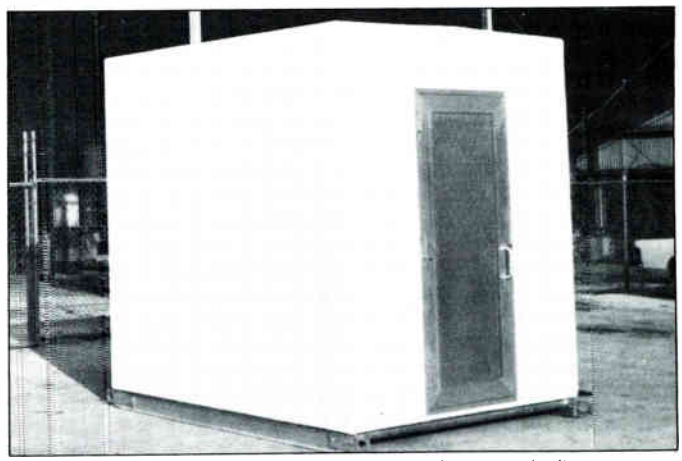


Tocom 5501A addressable baseband decoder

Rohn Introduces Fiberglass Equipment Shelters

Rohn's new modular fiberglass equipment shelters were designed to satisfy any communications equipment need. Made of polyester resin and chopped fiberglass, these shelters are available in standard design or can be custom-built. They arrive on the site completely assembled and ready to use. According to the company, the shelters are waterprcof, air- and dust-resistant and watertight.

For more information, contact Rohn, (309) 697-4400.



Rohn introduces modular fiberglass equipment shelters

New Satellite Receiver From Gardiner

A new satellite receiver from Gardiner Communications Corp. will be available for delivery this January.

Gardiner's satellite receiver Model 4350 is the first of a series of products soon to be introduced by the company.

The receiver features block-down conversion (first IF, 940-1940 MHz; second IF, 300 MHz), double conversion, standard remote control capability, improved video group delay correction and 100 to 130 volts rms per input. In addition, the unit's 1.75-inch height increases channel capacity in a standard rack. The unit come with optional notch fibers for terrestrial microwave interference. These fibers fit within the radio unit.

A company spokesman predicts the Model 4350's price will range from $1,200 to $1,500, depending on quantity ordered.

For more information, contact Gardiner, (214) 348-4747.

Antenna Receives Three Satellite Signals

Antenna Technology Corp. has introduced its Tri-Sat Antenna, an extension of its multibeam satellite antenna product line. Tri-Sat receives signals from three adjacent satellites simultaneously. It is manufactured in four- and five-meter parabolic versions.

For more information, contact Antenna Technology Corp. (702) 733-9658.

Multimode 444 MHz Addressable Converter Introduced

Kanematsu-Gosho (USA) Inc. has introduced the Sprucer II, a 444 MHz multimode (one-way and two-way), baseband, addressable terminal with a microprocessor-based, phase-locked, synthesized converter. Three tuning options—standard, I.R.C. and H.R.C.—are, provided. With a dual-cable plant, the number of channels can be doubled from 64 to 128 by an optional electronic RF switch that transparently switches between cables. Sprucer II provides pay security with a scrambling technique that includes 16 different modes of random video signal inversion. An optional infrared hand-held unit with a 20-button keyboard provides wireless remote control. Functions include 15-channel favorite memory; on/off; direct channel selection; upward and downward scanning; increasing and decreasing volume control; memorized channel scanning; impulse pay-per-view via password entry on all 128 channels; opinion polling and multilevel parental discretioncontrol.

For more information, contact Kanematsu-Goshu (USA) Inc.

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Contact Motorola Semiconductor Products, P.O. Box 20412, Phoenix, AZ 85036 for data. (602) 244-6394.

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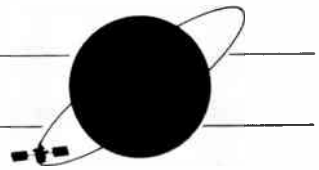

Signal	Day	Start/ Stop	Alert Tone	Trans-ponder
Satcom 3R				
ASCN-The Learning Channel	Weekdays Weekends	6 a.m./4 p.m. 6 a.m./1 p.m.	192*/#	**16**
ARTS	Daily	9 p.m./12 a.m.	311*/# (E,C,M) 519*/#(P)	**1**
Cable Health Network		24 hrs.	361*/#	**17**
CBN		24 hrs.	None	**8**
Cinemax		24 hrs.	None	**20 (E,C)** **23 (M,P)**
CNN		24 hrs.	024*/#	**14**
CNN Headline News		24 hrs.	635*/# 541*/#	**15**
C-SPAN		24 hrs.	195*/#	**19**
Daytime	Weekdays	1 p.m./5 p.m.	None	**22**
ESPN		24 hrs.	048*/#	**7**
Eternal World Television Network	Daily	8 p.m./12 p.m.	762*/#	**18**
HBO		24 hrs.	Program 729*/# Scramble 835*/# Duplication 940*/#	**24 (E,C)** **13, 22 (M,P)**
HTN Plus	Daily	4 p.m./4 a.m.	207*/#	**16**
The Movie Channel		24 hrs.	None	**5**
Modern Satellite Network	Weekdays	10 a.m./1 p.m.	243*/# 421*/#	**22**
MTV: Music Television		24 hrs.	None	**11**
National Jewish Television	Sundays	1 p.m./4 p.m.	None	**16**
Nickelodeon	Daily	8 p.m./9 p.m.	311*/# (E,M,C) 519*/# (P)	**1**
PTL		24 hrs.	None	**2**
Reuters	Weekdays	4 a.m./8 p.m.	None	**18**
Showtime		24 hrs.	576*/#	**12 (E,C)** **10 (M,P)**
Spotlight		24 hrs.	None	**4**
USA Blackout Network		O/V after 5 p.m.	295*#	**22**
USA Cable Network		24 hrs.	438*/#	**9**
WGN		24 hrs.	None	**3**
WTBS		24 hrs.	None	**6**
The Weather Channel		24 hrs.	None	**21**
Satcom 4				
The American Network	Daily	5 p.m./5 a.m.	None	**19**
BizNet	Weekdays	9 a.m./2 p.m.	None	**15**
Bravo	Daily	8 p.m./6 a.m.	None	**6**
The Entertainment Channel		24 hrs.	None	**8**
HBO	Mon-Fri Saturday Sunday	5:30 a.m./12 p.m. 6:30 a.m./5:20 a.m. 6:15 a.m./1 a.m.	729*/#	**18**
The Playboy Channel		8 p.m./6 a.m.		7
National Christian Network		6 a.m./8 p.m.	073*/#	7
Trinity (KTBN)		24 hrs.	None	**17**
Westar 4				
Eros	Thurs-Sat	11 p.m./2 a.m.		**10D**
Financial News Network	Weekdays	10 a.m./5 p.m.	975*/# 738*/#	**9X**
GalaVision	Weekdays Weekends	4 p.m./4 a.m. 24 hrs.		**12X**
SelecTV	Weekdays Weekends	8 p.m./4 a.m. 2 p.m./4 a.m.		**9X**
SIN		24 hrs.	None	**8X**
SPN		24 hrs.	429*/#	**11X**
Westar 5				
BET	Daily	8 p.m./2 a.m.	406*/#	**12X**
CBS Cable	Weekdays Weekends	4:30 p.m./4:30 a.m. 5 p.m./5 a.m.	524*/# 531*/#	**4D**
Satellite News Channel		24 hrs.	None	**4X, 6D** **7X, 8X, 9X**
WOR		24 hrs.	None	**2D**

Major Communications Satellites Serving North America

Location: Degrees West Longitude	Satellite	
	Present	**Future**
70		Southern Pacific-2 (Oct. 84)**
74		Galaxy-2 (Mid 84)
79		Advanced Westar-2**
83	Satcom-4	
87	Comstar-D3	Telstar-2
91	Westar-3	Advanced Westar-1**
94		SBS-3**
95	Comstar-D2 & D1	Telstar-1
97	SBS-2*	
99	Westar-4	
100	SBS-1*	
103		GTE-1*
104		Anik-C (Mid 82)
106		GTE-2*
109	Anik-B**	
114	Anik-2 & 3	
119	Satcom-2	Southern Pacific-1 (Feb. 84)**
123	Westar-2	
123.5	Westar-5	
127		Comstar-D4 (Mid 82)
		Telstar-3 (1986)
131	Satcom-3R	
135	Satcom-1	Galaxy-1 (Mid 82)
139		Satcom-1R (Mid 83)
143		Satcom-2R (1984)

*Ku Band
**Dual Ku/C Band

E eastern M mountain
C central P pacific

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

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

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Ask about our new addressable descrambler. A plain and simple product that eliminates the concept that addressability is "too complex" or "too much too soon" for today's cable systems.

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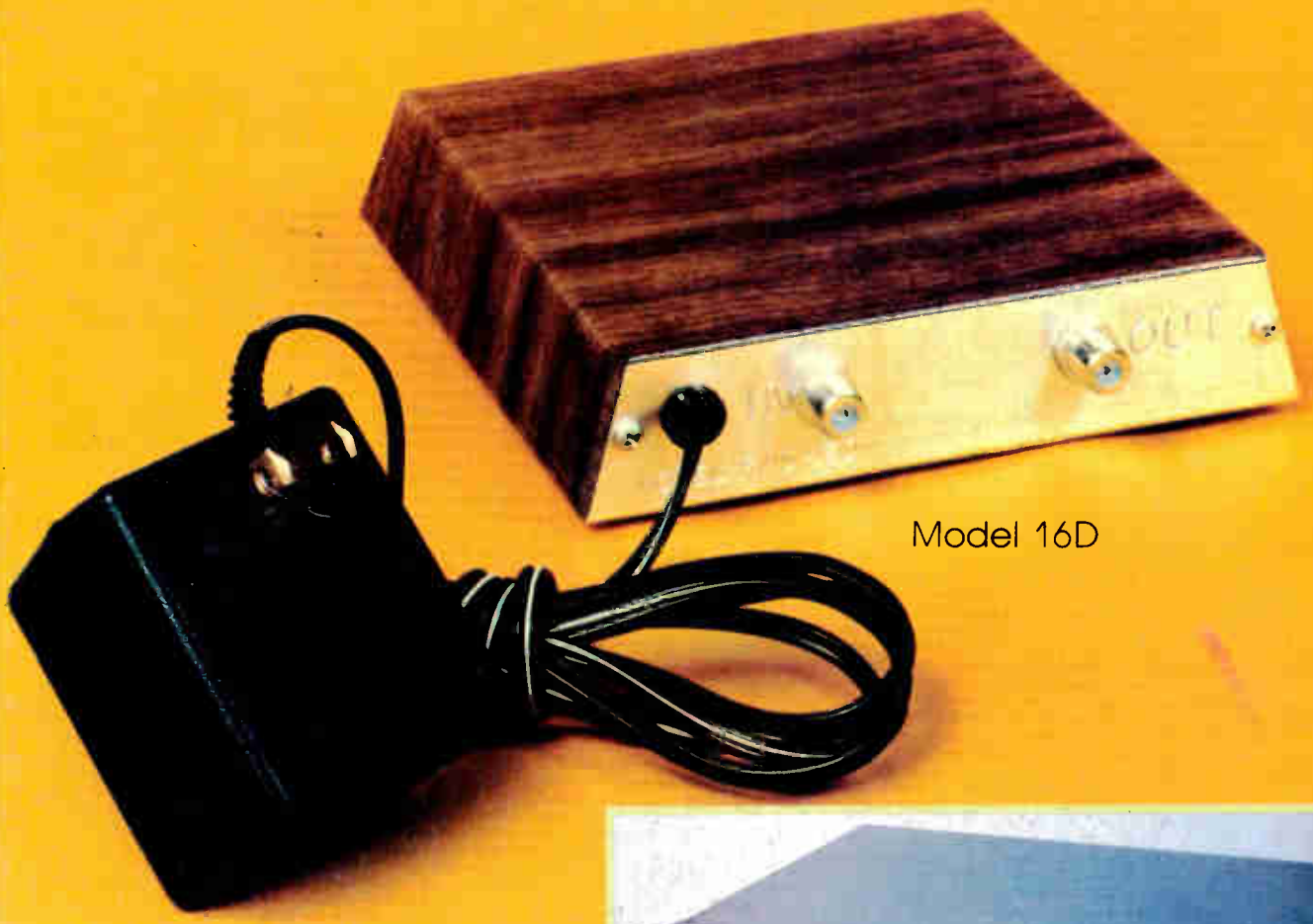

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